9104

MODELS

6360, 6370, 6380

Counting Units

Beckman

Operating and Servicing Manual

Electronic Instruments Division

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MODELS
6360, 6370, 6380
Counting Units

(PREFIX 500)

SERIAL NO._____

Beckman®
INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA • 94804

APRIL 1968

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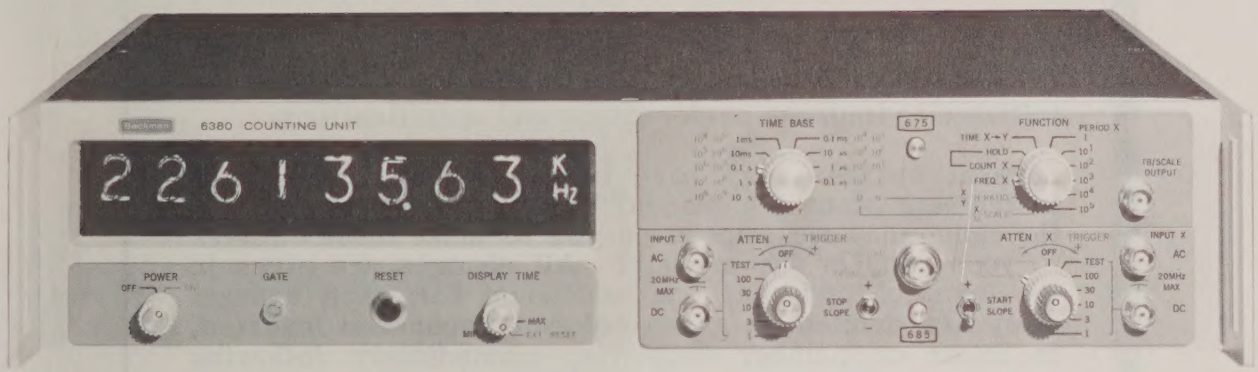

Model 6380 with
Model 675 Function Module and
Model 685 Input Module

Frontispiece

MANUAL REVISIONS

Beckman Instruments is continually striving to provide better quality in its products. As a result, changes are initiated to improve performance and specifications.

Several changes may have been incorporated in your instrument since the manual was last printed. If this is the case, may we impose on you to make these changes to your copy of the manual? All changes are given in the form of addenda, one addendum for each change. They are printed on green-colored paper and inserted, in letter or number sequence, immediately following this page. If a change does not apply to your instrument, please disregard the associated addendum.

PREFIX NUMBERS

The prefix number denotes a generation of manuals. All addenda for a certain prefix number are incorporated in the manual before reprinting and the number increased by one (e.g., "Prefix 500" becomes "Prefix 501").

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SECTION 1
INTRODUCTION

1.1 GENERAL

This manual contains operating and servicing instructions for the Beckman 6300 Series Counting Units, Models 6360, 6370, and 6380. These new Counting Units with oscillator, power supply, timing and counting circuits, and visual display, form the basic instrument to accommodate function and input plug-in modules for a variety of frequency and time interval measurements.

The input modules dictate the frequency range of the counter. The function modules determine the measurement functions performed. Different combinations of input and function modules produce counters adaptable to a wide variety of applications; for example, relay and switch timing, flow rate, ballistic measurements, and phase measurement. With external transducers, velocity and rpm can also be measured and displayed.

1.2 DESCRIPTION

A Model 6380 Counting Unit with a Model 675 Function Plug-In Module and a Model 685 Input Plug-In Module is shown on the Frontispiece. Front, top, and rear views are given on the Mechanical and Wired Assembly Drawing (number D435459, page 5-26). The glow-tube display and front-panel controls are shown in Figure 2-2, and are described in Table 2-3 of this manual. The rear panel is shown in Figure 2-1; switches and connectors on this panel are described in Table 2-2.

Figure 4-2 (Section 4) is a top view of the instrument with the top cover removed. As shown in the figure, the major sub-assemblies are the oscillator, the frequency multiplier, the printed circuit board, and the power supply.

The oscillator is crystal controlled; its crystal is enclosed in a temperature controlled oven. The frequency multiplier components are on a circuit board adjacent to the oscillator. The frequency multiplier raises the 1 MHz output of the oscillator to 10 MHz. The components on the printed circuit board are mainly integrated circuits (IC). The display glow tubes mount vertically, and plug into sockets which are integral parts of the printed circuit board.

The power supply of the Counting Unit operates either from 115 volts or from 230 volts; the selection is made by means of a switch on the rear panel. The power supply furnishes a high dc voltage for the display tubes, and low dc voltages for the oscillator and for the solid-state circuits of the Counting Unit and the plug-in modules. A standard six-foot power cord with a three-prong plug connects the instrument to the power source. The power supply is energized by means of the POWER switch on the front panel. The fuse for the power supply is on the rear panel.

1.3 MODEL DIFFERENCES

Beckman 6300 Series Counting Units are available as either six, seven, or eight-digit instruments. Model 6360 is the basic six-digit counting unit. Model 6370 has a seven-digit display, and Model 6380 is the full eight-digit version, with a ninth digit available as an option. All models can be used with any combination of Input and Function Plug-In modules.

1.4 SPECIFICATIONS

Specifications for the Model 6300 Series Counting Units are given in Table 1-1.

1.5 OPTIONS

Table 1-2 lists the various options available with the 6300 Series Counting Units.

Table 1-1. Specifications

DISPLAY:	Glow tubes, with display storage; 6, 7, or 8 digits.
Display Time:	0.1 to 10 sec, continuously variable or held indefinitely; remote reset provided.
Legend:	Hz, kHz, MHz for frequency measurements; s, ms, μs for period and time interval measurements.
Decimal Point:	Automatic positioning.
Accuracy:	±1 count, ± oscillator stability.
Frequency Standard:	1 MHz.
INPUT SIGNALS:	
External Frequencies:	1 MHz, 2.5 MHz, or 5 MHz; can be substituted for internal frequency standard with following voltage requirements: 1 MHz from 0.5V peak-to-peak to 6V peak-to-peak 2.5 MHz from 0.5V peak-to-peak to 6V peak-to-peak 5 MHz from 0.5V peak-to-peak to 1V peak-to-peak
Inhibit:	Contact closure to ground which must occur before end-of-print command.
Reset:	Positive-going signal, 1 μsec minimum pulse width.
OSCILLATOR STABILITY STANDARD:	3 parts in 10^7 per week; for higher stability oscillator, see Sec. 6, "Options".
OUTPUT SIGNALS:	6, 7, or 8 digits of 1-2-4-8 BCD; binary 1 is +4 volts; binary 0 is 0.5 volt, nominally.
Print Command:	+0.5 to +4 volts; 25 μsec wide, nominally.
Frequency Standard:	1 MHz.
Time Base:	0.5 to 3.0 volts, from 100Ω source, nominally.
Gate Markers:	"Open" is a +4 volt, 200 ns pulse; "Close" is a +4 volt, 200 ns pulse.
Maximum Count Frequency:	20 MHz or 200 MHz, depending on the input plug-in module used.
POWER:	115/230 volts ac, ±10%; selectable at rear panel; 50 to 400 Hz; 30 Watts.
TEMPERATURE:	Operating: 0 to +60°C. Storage: -55°C to +75°C.
Cooling:	No forced air ventilation required.
WEIGHT:	15 to 20 pounds.
DIMENSIONS:	3.5" high, 17" wide, 15.5" deep.

Table 1-2. Options

ACL	High Stability Oscillator; 3 parts in 10^9 per 24 hours.
ACM	Ultra-High Stability Oscillator; 1 part in 10^9 per 24 hours.
C1	No Internal Frequency Standard; operates as accumulator only. Compatible plug-ins are Models 672, 682, and 684. Does not accept external frequency standard.
C2	Operates in all functions and accepts all plug-in modules. External frequency standard of 1, 2.5, or 5 MHz, with 1 volt rms minimum amplitude must be supplied; 50Ω source impedance.
C3	9th digit complete with BCD output replacing legend indication (Model 6380 only).
C4	Decimal point and legend output at rear panel; 36-pin connector. Contact factory for specifications.
C5	Uninterrupted time base output pulses provided on time base positions of 1 ms or less. Not available in "Fast Recycle" mode.
C6	RFI shielding. Contact factory for specifications.
C7	Rack Ears. Extends instrument width to 19 inches; suitable for rack mounting.
C8	Relay Rack Slides. Chassis-Trak C-300S-18. (Includes option C7.)

SECTION 2
INSTALLATION & OPERATION

2.1 UNPACKING AND HANDLING

The Beckman 6300 Series Counting Units are thoroughly tested and inspected before shipment, then carefully packed. The unit should be unpacked with the care due any precision instrument. If the package shows it has been dropped or handled roughly, return it to the carrier unopened.

Remove the packing carton and the braces, being careful not to scar or damage the unit. Make a complete visual inspection of the equipment, checking for damage or missing components. Check that all switches and controls operate mechanically. Report any damage immediately to Beckman Instruments, Inc., Electronic Instruments Division.

2.2 RESHIPPING

Should it become necessary to return the unit to the factory for any reason, follow these packing instructions:

1) Wrap the unit in polyethylene sheeting, sealing all sides.
2) Punch small air holes in the sheeting.
3) Wrap the unit in rubberized hair and pack in a carton.
4) Seal the carton and mark it clearly: "FRAGILE -- HANDLE WITH CARE".

2.3 INSTALLATION

In all instances the Series 6300 Counting Units are portable or rack-mounted. No special installation requirements are necessary unless peripheral equipment is used, such as printers and oscilloscopes. In these cases, the unit should be located close to the support equipment.

WARNING

Do not mount the Counting Unit too close to the support equipment, as it requires adequate air ventilation. The heat sink for the power supply at the rear panel requires an air flow through it to transfer its heat, as it cools by convection. It does not need to be a forced air flow, however. The normal air flow of a ventilated or air-conditioned room is adequate.

The rack-mounted version of the Counting Unit comes equipped with rack ears. Integral rack slides can be ordered as an option. If slides are ordered, mount on rack, being careful that the instrument clears other equipment when moved in and out of the rack.

2.3.1 Connecting Auxiliary Equipment

Auxiliary equipment includes printers, oscilloscopes, signal generators, and other signal recording and signal sources. With the exception of the printer, connections to the auxiliary equipment are made through BNC connectors. The printer interconnects with the Counting Unit through multi-pin connector J1, at the rear panel (see Figure 2-1). An inhibit signal from the printer synchronizes counter recycle with printing time. Table 2-1 identifies each pin of connector J1.

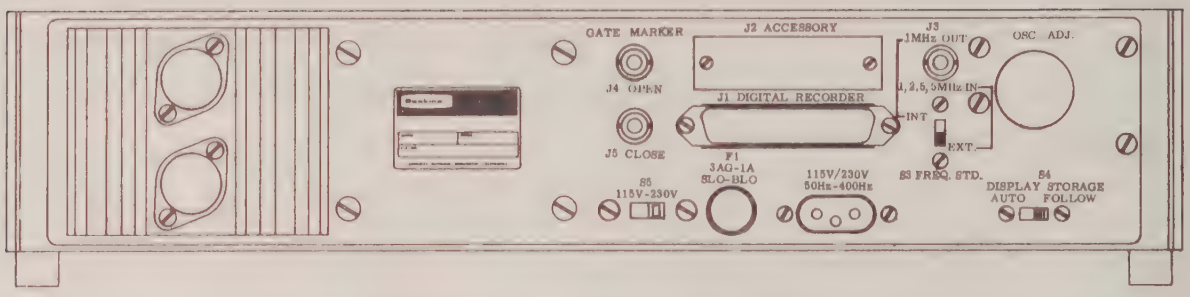


FIG. 2-1. Model 6380 Rear Panel.

Table 2-1. DIGITAL RECORDER: 50 Pin Connector - J1 Designations

Pin No.	Decimal Digit or Function	Binary Weight	Pin No.	Decimal Digit or Function	Binary Weight
1	1	2	26	5	4
2	1	1	27	5	8
3	1	4	28	6	2
4	1	8	29	6	1
5	2	2	30	6	4
6	2	1	31	6	8
7	2	4	32	7	2
8	2	8	33	7	1
9	3	2	34	7	4
10	3	1	35	7	8
11	3	4	36	8	2
12	3	8	37	8	1
13	4	2	38	8	4
14	4	1	39	8	8
15	4	4	40	9	2
16	4	8	41	9	1
17	5	2	42	9	4
18	5	1	43	9	8
19	PRINT		44	EXT RESET	
20	GND		45	$\overline{\text{INHIBIT}}$	
21	AUX. 1		46	6 Suppression	
22	AUX. 2		47	7 Suppression	
23	AUX. 3		48	8 Suppression	
24	AUX. 4		49	9 Suppression	
25	AUX. 5		50	Not Used	

1) Digit 1 is least significant digit; Digit 9 is most significant digit.
2) Digit 1 is normally used as Legend. (Digit 2, therefore, is normally least significant digit.)

NOTE

Figure 2-1 shows the Model 6380 rear panel; Table 2-2 describes the connectors and switches on the rear panel.

Figure 2-2 shows the Model 6380 front-panel controls and glow-tube display; Table 2-3 describes the front-panel controls and indicators.

Table 2-2. Rear-Panel Connectors and Switches

GATE MARKER OPEN Connector (J4)	Supplies a GATE OPEN pulse. The pulse height is +4 volts; the width is nominally 200 ns. This pulse is coincident with the leading edge of the GATE pulse.
GATE MARKER CLOSE Connector (J5)	Supplies a GATE CLOSE pulse. The pulse height is +4 volts; the width is nominally 200 ns. This pulse is coincident with the trailing edge of the GATE pulse.
115 - 230 Volt Switch	Selects the power supply transformer connections for either 115V ac or for 230V ac operation, depending upon power input voltage.
DIGITAL RECORDER Multi-Pin Connector	Interconnects the Counting Unit and an external digital printer. Pin connections for this connector are given in Table 2-1.
1 MHz OUT, 1, 2.5, 5 MHz IN Connector	Provides the 1 MHz output of the internal oscillator when switch is in INT position. This connector is used in conjunction with the FREQ STD switch. The signal amplitude is nominally 1 volt rms. With the FREQ STD switch in the EXT position, the internal oscillator is disconnected and an external frequency standard of 1, 2.5, or 5 MHz may be substituted in its place. CAUTION Never connect an external signal source to this connector when the FREQ STD switch is in the INT position.
DISPLAY STORAGE Switch (in AUTO position)	Displays on the readout the total count of each counting interval and holds it without change until there is a new total count (in all functions except COUNT and SCALE where the display is continually updated). In all functions with the switch in the FOLLOW position, the display is continually updated.

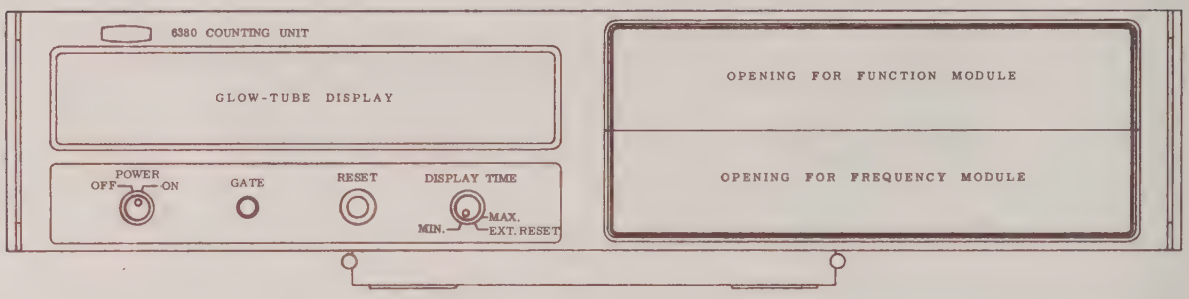


FIG. 2-2. Model 6380 Front-Panel Controls and Glow-Tube Display.

Table 2-3. Front-Panel Controls and Indicators

Glow-Tube Display	Indicates the measurement selected at the Function Plug-In module. Information is displayed in decimal form. The displayed count value is the total of gated events entered into the instrument subsequent to the last master reset command. While information is being displayed, the accumulator is counting new data. If the full count capability of the accumulator is exceeded, the accumulator recycles to zero, continues counting, and the OVERFLOW lamp lights. The OVERFLOW lamp then remains lighted until the instrument is reset.
POWER Switch (in ON position)	Applies ac power to the Counting Unit. The application of ac power is indicated when the glow tubes of the display are lighted.
GATE Indicator	Lights when the control gate is open for input events.
RESET Pushbutton Switch	Resets the Counting Unit to zero when pressed momentarily. NOTE If for any reason (such as improper use of controls) the instrument should stop gating, simply press the RESET button on the front panel. The unit will then resume correct operation.
DISPLAY TIME Control	Provides means of adjusting the display time which is variable from approximately 0.1 to 10 seconds. The minimum display time is obtained with the control in its maximum counterclockwise position. This time is increased progressively as the control is rotated clockwise. When set to the EXT RESET position, the unit recycles on an external command.

2.3.2 Applying Power

Determine whether 115 volt or 230 volt ac power is available, and set switch S5 (Figure 2-1) on the rear panel accordingly. Plug power connector into power source. The crystal oven is energized immediately. The oscillator requires approximately one hour to warm up to operating temperature.

2.3.3 Installing Plug-In Modules

The Function Plug-In module occupies the top slot. It should slide easily and mate with the connector at the rear of the slot. To install the module, push it gently until the back of its panel is flush against the front panel of the Counting Unit. Then push the locking screw on the top center of the unit; a faint click should be heard. (The locking screw remains receded from its former position.) Install the Input Plug-In module in the same way. To remove the modules, simply push in on the locking screw to release it; then pull out the module.

2.4 OPERATING CONTROLS & INDICATORS

The operating controls and indicators of the Counting Unit are on the front panel and are shown in Figure 2-2 for the Model 6380. The connectors and three switches are on the rear panel and are shown in Figure 2-1. In the text all operating controls and indicators are called out as they appear on the equipment. For example, set the POWER switch to the ON position. Rear and front-panel controls and connectors are described in Tables 2-2 and 2-3, respectively.

2.5 OPERATION

The Models 6360, 6370, and 6380 contain the power supplies for the Counting Units and each plug-in module. Power is controlled by the POWER OFF-ON switch on the front panel.

The length of display time is regulated by the DISPLAY TIME switch on the front panel. It is continuously adjustable from 0.1 to 10 seconds, or it may be switched to EXT RESET for remote control.

The counter is cleared by pressing the RESET button on the front panel. This not only clears the visual display but it also clears all DCUs in the Counting Units and plug-ins.

NOTE

Operating instructions are not provided in this manual because the operation of instrument is mainly carried out by the controls of the Function and Input Plug-In modules.

Refer to the respective manual of each module for operating instructions.

SECTION 3
PRINCIPLES OF OPERATION

3.1 GENERAL

The theory of operation of the Counting Unit is described in this section. The discussion, presented in three parts, includes a general functional description, integrated-circuit logic descriptions, and detailed logic descriptions.

For the general functional description, the circuits have been grouped according to function, and the discussion is keyed to a block diagram. Significant timing and control signals are described in terms of how they govern the sequence of operations. Their point of origin and changes that occur to the signals are discussed from a functional viewpoint, rather than in terms of specific logic levels or electrical changes. The object is to show the overall operation of the instrument and provide the background for more detailed logic descriptions.

In the discussion of integrated circuits, emphasis has been placed on the circuit's logic operation. Thus, input and output logic states are given for each element for all possible logic conditions. From this, the relationship between input and output is quickly determined when the integrated circuits are interconnected, or when they are used with other logic elements.

The detailed logic description is an elaboration of the block diagram description. Each functional section is described in sufficient detail that all significant waveforms are covered. For this equipment, a better understanding is gained by considering the time relationships that exist between signals, than by considering most other parameters of the signals. Thus, timing waveforms that inter-relate the various signals are illustrated wherever they are applicable.

3.2 GENERAL FUNCTIONAL DESCRIPTION

The Counting Unit performs as many as six separate measurements, depending upon the Function Plug-In module that is used. These measurements are frequency, period, time interval, frequency ratio, random event counting, and scaling of input frequencies. Frequencies that the Counting Unit must measure are a function of the Input Plug-In module. The resolution that the instrument offers, however, depends on the number of digits in the Counting Unit. The Model 6360 is the basic six-digit Counting Unit. Model 6370 has a seven-digit display, and Model 6380 is the eight-digit version, with a ninth digit available as an option.

Figure 3-1 is a block diagram of the Model 6380 Counting Unit. Block diagrams of the other two models would be identical, except for the number of indicators and related DCU, storage, decoder, and BCD outputs that they contain. Consequently, the block diagram for Model 6360 would not show DS8 and DS9 and their related DCUs, storage, and decoders. Similarly, the block diagram for Model 6370 would not show DS9 and its related DCU, storage, and decoder. The flip-flop, lamp driver, and overflow (shown on the right side of the DCU chain) are contained in each model and the flip-flop is always triggered by the last DCU in the circuit.

3.2.1 Measurements

The manner in which a particular measurement is made is controlled by the Function Plug-In module. This module sends $\overline{\text{Start}}$ and $\overline{\text{Stop}}$ signals to the Counting Unit that may be derived internally, or from the incoming signal. The $\overline{\text{Start}}$ and $\overline{\text{Stop}}$ signals generate an accurately

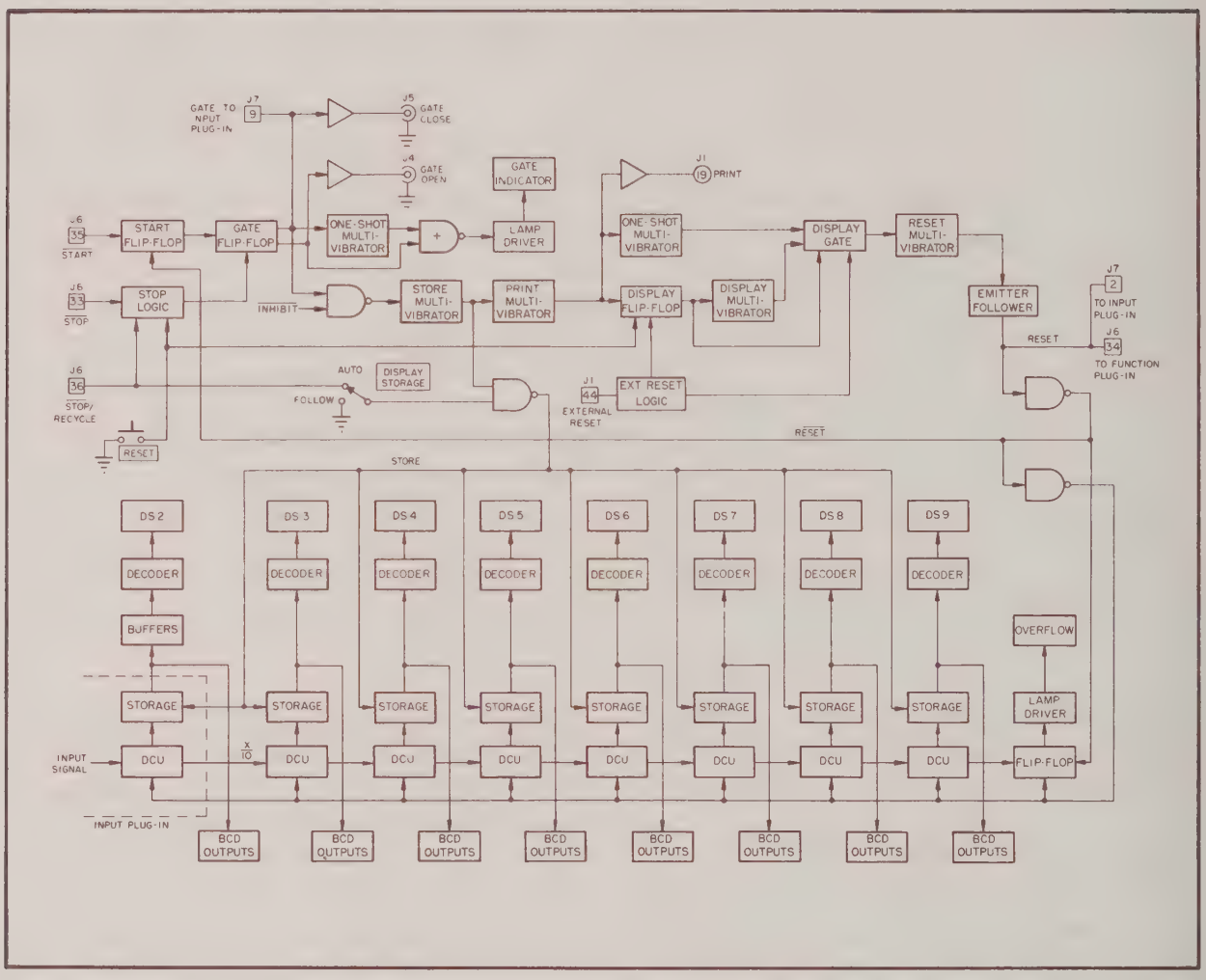


FIG. 3-1. Model 6380 Block Diagram.

controlled Gate, which is fed to the Input Plug-In module. The Gate also initiates a sequence of operations in the Counting Unit in which signals enabled by the Gate pass from the Input Plug-In to the Counting Unit, and are subsequently processed as follows:

a) While the Gate is being generated, the input signals are counted by a decimal counting unit (DCU) in the Input Plug-In module. The output of this DCU triggers the first DCU of a seven-digit accumulator in the Counting Unit. If the full count of the accumulator is exceeded, the last DCU of the accumulator sets a flip-flop, which in turn lights the OVERFLOW indicator.

b) At the termination of the Gate, the Store pulse is generated. The Store pulse shifts the count of the accumulator into a storage register. The data now present in the storage register is in BCD form. It is decoded to decimal form and displayed on the glow tube display.

c) After data is stored, a Print command is generated. Data appearing in the storage register is available in BCD form through buffer amplifiers at a rear-panel connector. An external recorder receiving these signals would record them at this time.

d) Following the Print command, there is a Display period. The duration of this period is controlled by the DISPLAY TIME control on the front panel. It is variable from 100 milliseconds to 10 seconds.

e) After the Display period, the DCUs of the accumulator and the Overflow flip-flop are reset. Data is still in the storage register and is being displayed; but the accumulator is cleared so a new count will be accumulated when the Gate is generated.

3.2.2 Circuit Operation

The $\overline{\text{Start}}$ and $\overline{\text{Stop}}$ signals appear simultaneously at the Counting Unit; but the logic is such that at this point of circuit operation, only the $\overline{\text{Start}}$ signal is effective.

The $\overline{\text{Start}}$ signal sets the start flip-flop, which in turn sets the gate flip-flop. The gate flip-flop sends the Gate pulse to the Input Plug-In module, to a one-shot multivibrator, and to a NAND gate. The Gate pulse allows the signal to be counted to pass to the DCU in the Input Plug-In module. The output of this DCU is then counted by the accumulator in the Counting Unit. The signal going to the one-shot multivibrator causes the multivibrator to produce a 50 millisecond pulse. This pulse and the output of the gate flip-flop are OR-gated to drive a lamp driver, which ionizes the GATE indicator.

The signal going to the NAND gate has no effect on the gate until an incoming $\overline{\text{Stop}}$ pulse resets the gate flip-flop and terminates the Gate pulse. As the Gate goes negative, it produces an output from the NAND gate. This output triggers the store multivibrator, and the multivibrator generates the Store pulse. The Store pulse transfers the count of the accumulator into a storage register. The count is decoded from BCD to decimal, and appears on the front panel glow tubes.

As the Store pulse terminates, it triggers the print multivibrator. The print multivibrator generates a 25 microsecond pulse, which is available at pin 19 of connector J1 through a buffer amplifier.

The print multivibrator, upon going back to its quiescent state, simultaneously triggers a one-shot multivibrator and the display flip-flop. The display flip-flop, in turn, triggers the display multivibrator. The display multivibrator output and the output of the one-shot multivibrator generate a display gate. The duration of the display gate is controlled by the DISPLAY TIME control on the front panel. The minimum duration is 100 milliseconds; the maximum is 10 seconds.

At the conclusion of the display period, the display gate triggers the reset multivibrator. The reset multivibrator generates a 5 microsecond pulse, which is coupled through an emitter follower to output connectors J6 and J7. These connectors send the Reset pulse to the Input and to the Function Plug-In modules. The Reset pulse is also inverted; it resets the overflow flip-flop, the DCUs of the accumulator, and the start flip-flop. The accumulator is now clear and ready to accumulate a new count when the subsequent Gate pulse is generated. The data in the storage register continues to be displayed.

3.3 INTEGRATED CIRCUIT LOGIC

Monolithic integrated circuits are used extensively in Beckman counters. In some cases an IC package contains two or more basic logic elements, such as resistor-transistor logic gates (RTL), diode-transistor logic gates (DTL), transistor-transistor logic gates (TTL), buffer amplifiers, and flip-flops. These basic logic elements are interconnected to perform the required logic function.

In other IC packages, such as the DCU and the BCD-to-decimal decoder, the logic elements are interconnected internally, and little or no wiring external to the package is required. These packages simply receive the input signal(s) and produce the required outputs.

In the following paragraphs, typical circuits are shown symbolically and/or schematically. Truth tables or waveforms are included to define logic outputs for the different logic inputs. In this equipment, a high level is "true"; a low level is "false".

3.3.1 Resistor-Transistor Logic Gate (RTL)

Figure 3-2 illustrates a typical RTL gate. This circuit, for positive logic signals, is a NOR gate. NOR gates can be considered as OR gates whose outputs are inverted. If either of the inputs is high, then the output is low. Only when both inputs are low simultaneously is the output high.

3.3.2 Diode-Transistor Logic Gate (DTL)

Figure 3-3 illustrates a typical DTL gate. As shown in the truth table, the output is high for all logic input conditions, except when both inputs are high simultaneously.

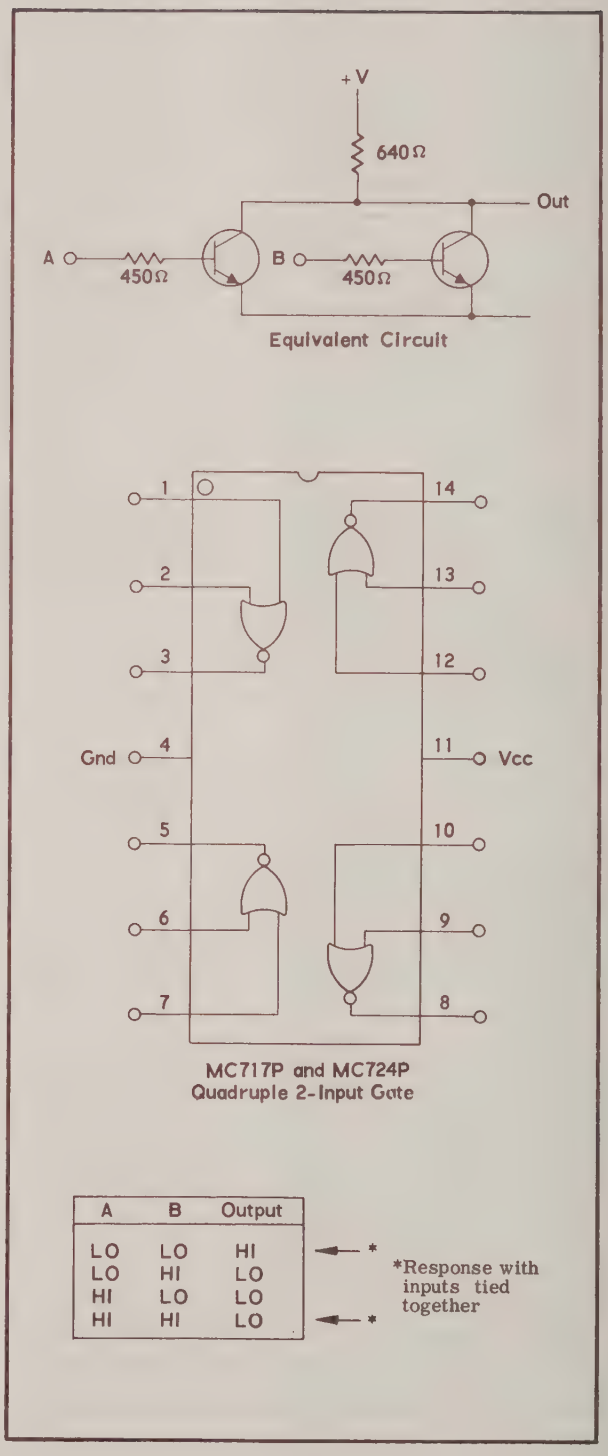


FIG. 3-2. RTL Gate Logic.

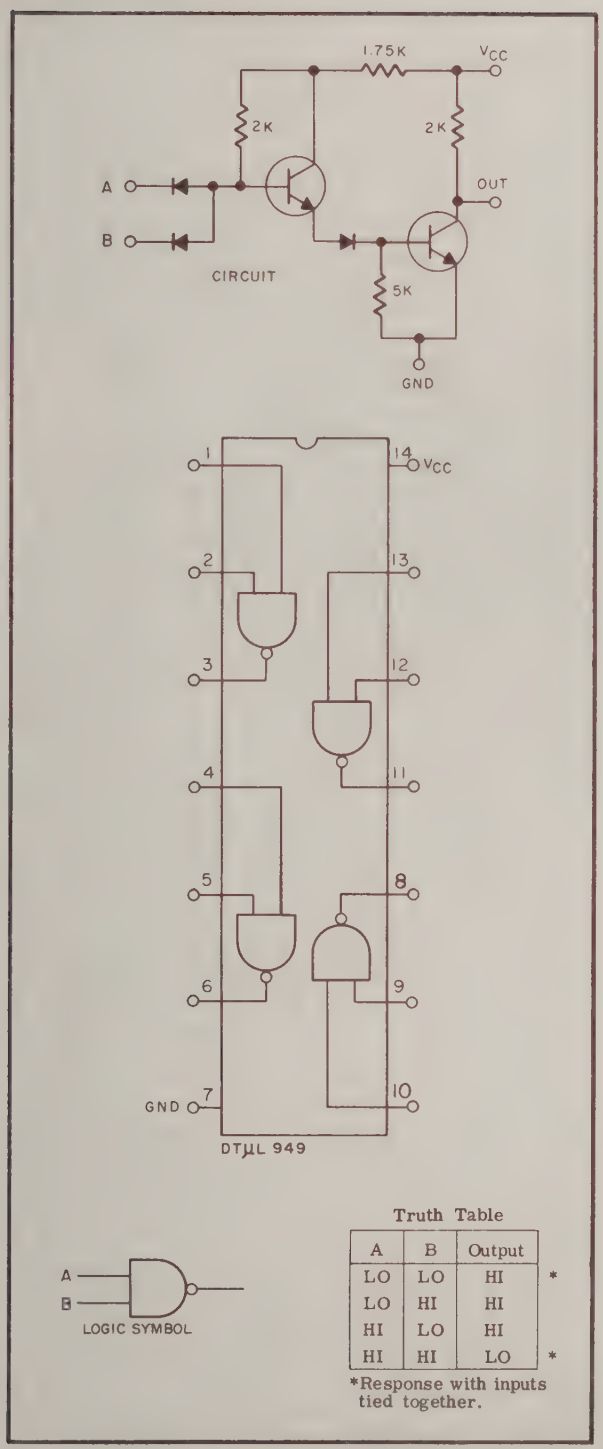


FIG. 3-3. DTL Gate Logic.

The circuit consists of an AND gate, an emitter follower, and a common emitter amplifier. The AND gate produces a high output only when its two inputs are also high. The emitter follower couples the output of the AND gate to the common emitter amplifier. Thus, the transistor is ON only when the output of the AND gate is high.

3.3.3 Five-Input DTL Gate

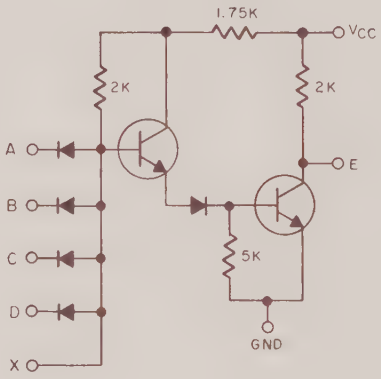
Figure 3-4 illustrates a DTL gate with five inputs. Circuit operation is identical to the DTL gate shown in Figure 3-3. Two of these NAND gates (not AND) are contained in a single package. Two or more inputs are used for the NAND function; other inputs are left open. When all inputs are used, an external diode is usually connected to pin X. The logic equation for this circuit shows that if any input is false, the output is true.

3.3.4 Transistor-Transistor Logic Gate (TTL)

Figure 3-5 illustrates a two-input TTL gate. Note that logically this gate is the same as the DTL gate. TTL gates are used mainly because they are capable of supplying more current than a comparable DTL gate. They have good capacitive load driving capabilities. In this equipment, the TTL IC packages contain four NAND gates.

3.3.5 Buffer Amplifiers

Figure 3-6 illustrates an IC package that contains six buffer amplifiers. As shown in the truth table, these buffers invert the input. Buffer amplifiers provide power amplification and isolate the signal source from the external loading.



POSITIVE LOGIC

$$E = \overline{A \cdot B \cdot C \cdot D \cdot (X)}$$

$$= \bar{A} + \bar{B} + \bar{C} + \bar{D} + (\bar{X})$$

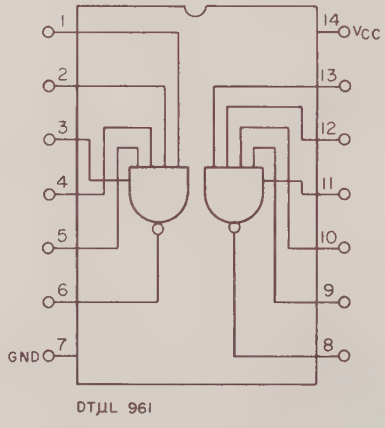
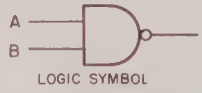
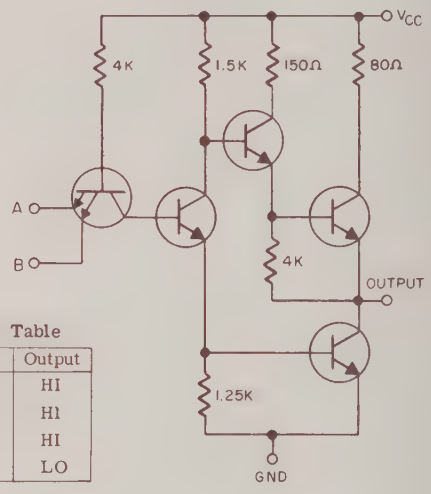


FIG. 3-4. Five-Input DTL Gates.





Truth Table

A	B	Output
LO	LO	HI
LO	HI	HI
HI	LO	HI
HI	HI	LO

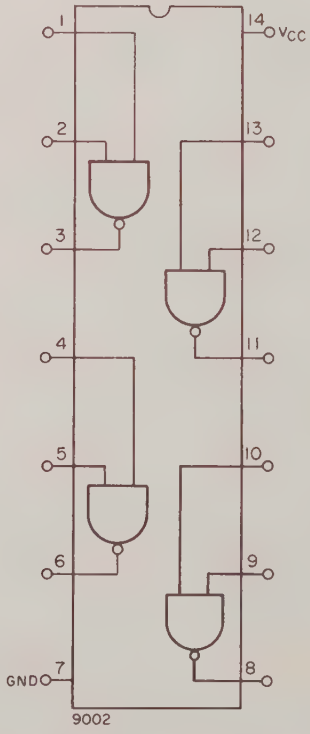
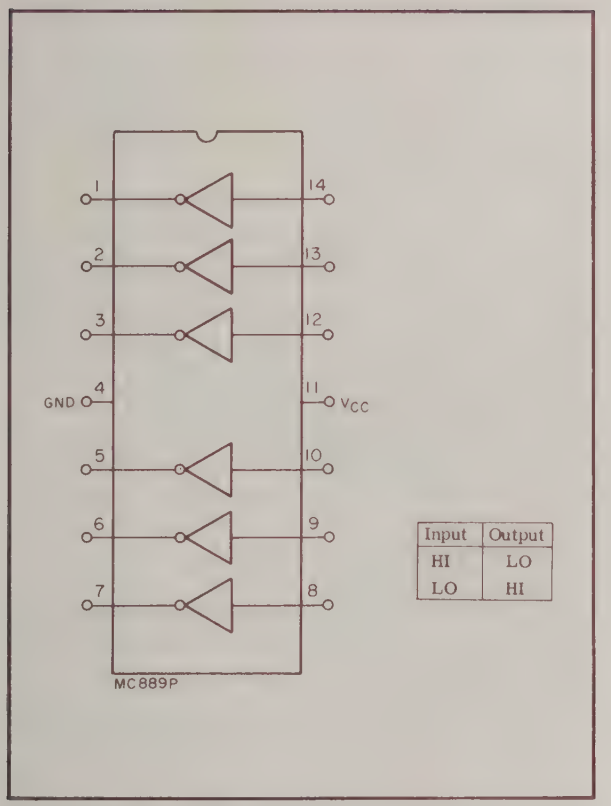


FIG. 3-5. Two-Input TTL Gates.



Input	Output
HI	LO
LO	HI

FIG. 3-6. Buffer Amplifiers.

3.3.6 Dual J-K Flip-Flop

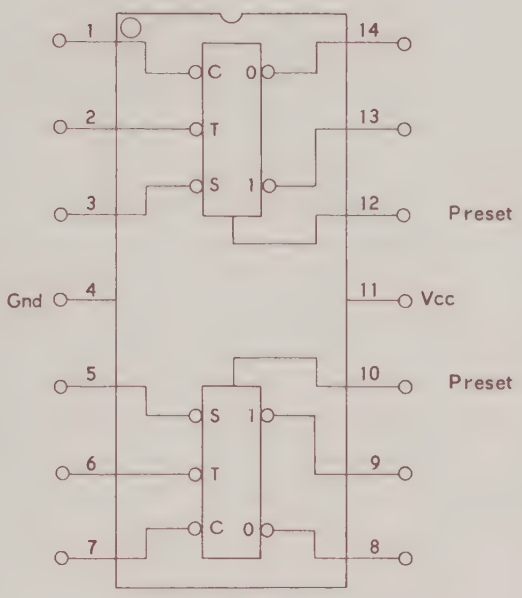
The flip-flop, shown in Figure 3-7 operates as follows:

1) Preset

A high (+2.4 to +5.0) logic level on the preset line will cause the "1" output to go "Lo" and the "0" output to go "Hi". This occurs without the need for any particular trigger, Set, or Clear input.

2) Set and Clear (Preset in "Lo" state)

Whenever the trigger input changes from Hi to Lo, the output of the flip-flop responds to Set and Clear according to the truth table (Figure 3-7).



Top View
MC790P Dual J-K Flip-Flop

Flip-Flop Truth Table				
Set	Clear	"1"	"0"	Remarks
HI	HI			No change in outputs.
HI	LO	HI	LO	Used as "1" state in count chain.
LO	HI	LO	HI	Used as "0" state in count chain. (Preset condition.)
LO	LO			Toggling occurs (outputs reverse state).

FIG. 3-7. Flip-Flop.

3.3.7 Decimal Counting Unit

Figure 3-8 illustrates the decimal counting unit. This device consists of four flip-flops interconnected to recycle after it counts ten input pulses.

The outputs are in 1-2-4-8 BCD form; waveforms are shown for each flip-flop. The A flip-flop is a binary counter. The B, C, and D flip-flops make up a divide-by-5 counter. Thus, when an external lead is connected between pins 1 and 12, the device is a divide-by-10 counter.

3.3.8 BCD-to-Decimal Decoder/Driver

Figure 3-9 illustrates a BCD-to-decimal decoder/driver. This IC package converts the BCD outputs of the DCU (Figure 3-8) to decimal form. As shown in the associated truth table, only one particular output is ON for each of the ten different input configurations. The output that is ON completes the circuit for a corresponding cathode of the glow tube that displays the decimal number.

3.4 DETAILED LOGIC DESCRIPTION

The logic circuits of the Counting Unit are explained in greater detail in the following paragraphs. The explanation is mainly a discussion of the controlling timing signals of the unit. Figure 3-10 illustrates these signals; they govern the sequence of operations within the Counting Unit, and supply the Gate and Reset Signals to the plug-in modules.

In the logic description, logic elements are referred to by an abbreviated form that combines the individual active components of the logic element. For example, a flip-flop that is made up of cross-coupled NAND gates (such as Z3B and Z3C), is identified by the symbol designations of the constituent NAND gates as "flip-flop Z3B-C".

3.4.1 Sequence of Operation

The Counting Unit operates in accordance with a repetitive sequence that is established by the timing signals illustrated in Figure 3-10. The sequence involves counting, storing, printing, displaying, and resetting. The pulses or commands that govern these functions are Gate, Store, Print, Display, and Reset, respectively.

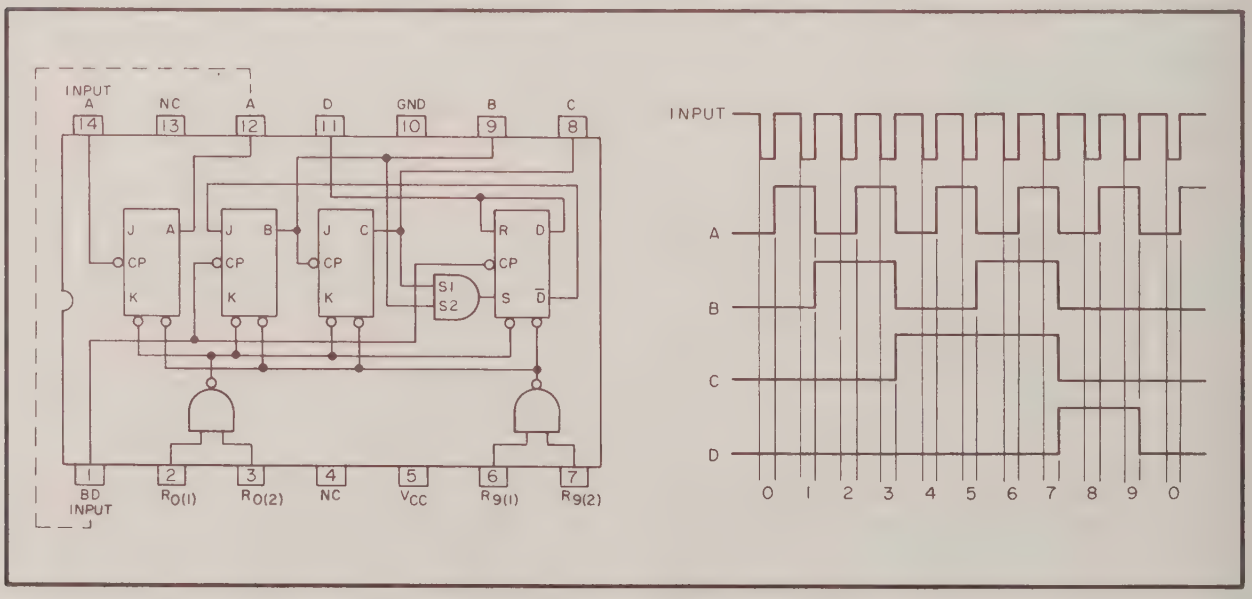


FIG. 3-8. Decimal Counting Unit (DCU).

Truth Table

Input				Output ON*
D	C	B	A	
LO	LO	LO	LO	0
LO	LO	LO	HI	1
LO	LO	HI	LO	2
LO	LO	HI	HI	3
LO	HI	LO	LO	4
LO	HI	LO	HI	5
LO	HI	HI	LO	6
LO	HI	HI	HI	7
HI	LO	LO	LO	8
HI	LO	LO	HI	9

*All other outputs are OFF.

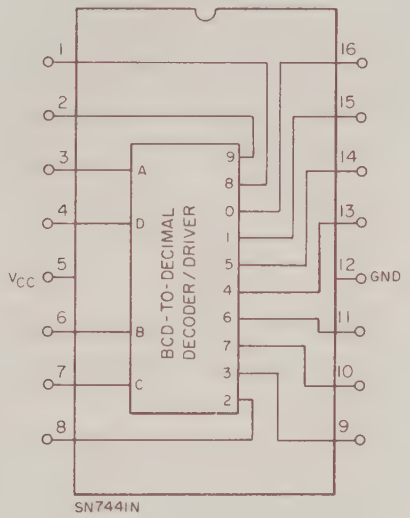


FIG. 3-9. BCD-to-Decimal Decoder/Driver.

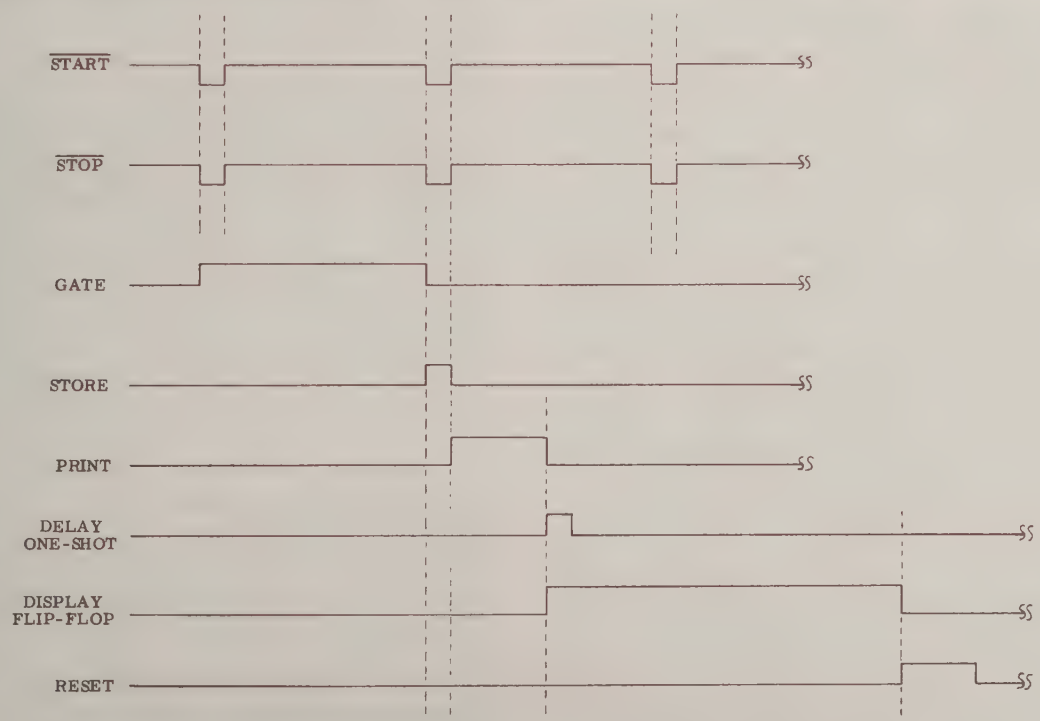


FIG. 3-10. Timing and Control Signals - Model 6300 Series Counting Units.

For convenience, the description of the circuits follows this same pattern. Thus, the sequence is assumed to start immediately before the generation of the control gate. The sequence progresses and terminates with the generation of the Reset pulse. The entire pattern is repetitive at a rate selected by the DISPLAY TIME control.

3.4.2 Generating the Control Gate

Refer to Model 6380 Logic Diagram (drawing number E435462).

The control Gate is generated by the first $\overline{\text{Start}}$ signal that occurs after the Counting Unit is reset. The Gate is terminated by the first $\overline{\text{Stop}}$ pulse that occurs after the aforementioned $\overline{\text{Start}}$ signal. Input signals, $\overline{\text{Start}}$ and $\overline{\text{Stop}}$, originate at the Function Plug-In module.

Before the $\overline{\text{Start}}$ and $\overline{\text{Stop}}$ signals are applied to the Counting Unit to generate the Gate, flip-flops Z1A-D and Z1B-C are in the reset state. The negative-going $\overline{\text{Start}}$ pulse, coupled by capacitor C1, sets flip-flop Z1A-D. The negative-going pulse generated at the false output of the flip-flop then sets flip-flop Z1B-C. This flip-flop generates the Gate, which is fed back to the Input Plug-In module through pin 9 of connector J7, and is also applied to diode CR4. Further incoming $\overline{\text{Start}}$ pulses to flip-flop Z1A-D have no effect upon it; it remains in the set state until it is reset at the end of the sequence by the Reset pulse.

The complement gate generated at the false output of flip-flop Z1B-C simultaneously with the Gate goes to capacitors C6 and C8. Capacitor C6 differentiates the negative-going leading edge of the signal, causing buffer amplifier Z9F to produce a narrow, positive-going Gate Open pulse at connector J4. Capacitor C8 also differentiates the negative-going signal, and it triggers the Z3B-C one-shot multivibrator. The one-shot multivibrator produces a 50 millisecond positive pulse, which is OR-gated with the Gate pulse. The OR gate output drives transistor Q1 into saturation, thus ionizing the GATE indicator.

Note that the output of the one-shot multivibrator is a 50 millisecond pulse, regardless of the time duration of the Gate. For operation at high frequencies, the duration of the Gate is short compared to the output of the one-shot multivibrator. If the Gate were the only signal driving transistor Q1, it would be difficult to determine that the Gate was being generated by observing DS10, the GATE indicator. Thus, the one-shot multivibrator supplies a pulse that is wide enough to ionize the GATE indicator long enough to provide a positive indication.

3.4.3 Terminating the Gate

The first $\overline{\text{Stop}}$ pulse that occurs after the Gate generation is in process terminates the Gate. The $\overline{\text{Stop}}$ pulse enters the Counting Unit via pin 33 of the connector, and is coupled by capacitor C2 to NAND gate Z2A. This NAND gate causes the output of NAND gate Z2B to swing negative, resetting flip-flop Z1B-C and terminating the Gate pulse.

3.4.4 Store Pulse

When flip-flop Z1B-C resets, NAND gate Z2B produces a negative-going output. This signal is differentiated by capacitor C24, and it triggers the Z3A-D one-shot multivibrator. The one-shot multivibrator produces a 1.5 microsecond positive-going signal at Z3A.

The negative-going signal produced by Z3B is coupled by diode CR6 to NAND gate Z8D. The output of NAND gate Z8D then swings positive, emitting the Store pulse to the accumulator and to the Input Plug-In module.

3.4.5 Print Command

The Print command is a 40 microsecond, positive pulse that is developed at the termination of the Store command. One-shot multivibrator Z3A-D, as it flips back to the quiescent state, initiates the pulse.

The negative-going output of one-shot multivibrator Z3A-D is differentiated by capacitor C12. The differentiated pulse triggers the Z4A-D one-shot multivibrator, which sends a 25 microsecond, negative pulse to the base of transistor Q2. The negative pulse turns off the transistor, generating a +5 volt Print command.

3.4.6 Display Time

Following the transfer of data from the accumulator to the storage register, and the subsequent printing of the data, the data is displayed in accordance with the setting of the DISPLAY TIME control. At its minimum setting, the display time is approximately 100 milliseconds; the maximum display time is about 10 seconds.

As illustrated in Figure 3-10, the Display pulse starts at the termination of the Print command. The pulse illustrated is the output of NAND gate Z7B; thus, all inputs to this gate are high immediately before the pulse is generated.

As the Z4A-D one-shot multivibrator flips to its quiescent state, terminating the Print command, capacitor C14 sends a negative pulse to the Z4B-C one-shot multivibrator. Simultaneously, capacitor C16 also sends a negative pulse to NAND gate Z5-B. The pulse from capacitor C14 triggers the Z4B-C one-shot multivibrator. The multivibrator produces a 3 microsecond pulse, which causes the output of NAND gate Z5C to go negative. NAND gate Z7-B, responding to the negative level, produces a high output.

Meanwhile, the pulse from capacitor C16 causes the output of NAND gate Z5B to go high. This gate, in turn, causes the output of NAND gate Z7A to go low. NAND gate Z7A latches NAND gate Z5B in this logic state, and sends a low logic signal to NAND gate Z7B. Thus, the negative outputs of NAND gates Z5C and Z7A are simultaneously applied to NAND gate Z7B.

The high logic level at the output of NAND gate Z5B is coupled by diode CR10 to the DISPLAY TIME potentiometer. Capacitor C19 starts charging to this high logic level through resistor R35 and the DISPLAY TIME potentiometer. Eventually, the charge across the capacitor overcomes the base-to-emitter bias of transistor Q3, and the transistor turns on. Transistor Q3, in turn, drives transistor Q4 into saturation. The low logic level at the collector of transistor Q4 is sensed by NAND gates Z7B and Z7A. This causes the output of NAND gate Z7A to go high, which unlatches NAND gate Z5B, making its output go low; but it also keeps a low logic input at NAND gate Z7B. Thus, the output of NAND gate Z7B remains high.

Driving the output of NAND gate Z5B low places the junction of diode CR10 and the DISPLAY TIME potentiometer at approximately ground potential. This stops capacitor C19 from charging, and it lowers the base-to-emitter bias of

transistor Q3. Capacitor C19 starts discharging, mainly through resistor R36, transistor Q3, and transistor Q4. The discharge time is approximately 5 microseconds. During this time, transistor Q4 keeps the output of NAND gate Z7B high. When capacitor C19 discharges sufficiently, the output of the NAND gate goes low. This terminates the display time.

3.4.7 Reset

The Reset pulse is generated immediately following the display time. The output of NAND gate Z7B swinging in the negative direction triggers the Z6B-C one-shot multivibrator. The one-shot multivibrator generates a 5 microsecond, positive pulse that is coupled by emitter-follower Q5 to NAND gate Z6D and to the Reset line (pin 2 of connector J7, and pin 34 of connector J6).

NAND gate Z6D emits the $\overline{\text{RESET}}$ command to NAND gate Z8C and to flip-flops Z8A-B and Z1A-D. NAND gate Z8C resets the accumulator. Flip-flop Z8A-B extinguishes the OVERFLOW indicator (if an overflow had occurred). Flip-flop Z1A-B resets to await the next $\overline{\text{Start}}$ pulse, which starts the cycle over again.

3.4.8 External Reset

The Counting Unit can be reset externally by turning the DISPLAY TIME control to the EXT position, and then grounding pin 44 of connector J1. Setting the EXT RESET switch to the EXT position produces low logic levels from NAND gates Z5D and Z5A. NAND gate Z5D forces the output of NAND gate Z5C high, clamps diode CR11 low, and forces the output of NAND gate Z7A high. NAND gate Z5A forces the output of NAND gate Z7B high.

The external ground connection at pin 44 of connector J1 forces the output of NAND gate Z5A high. Since all other inputs to NAND gate Z7B are also high, the output of this gate goes low. This negative-going excursion is identical to the Display command going negative. The Reset pulse is thus generated as described in paragraph 3.4.7.

3.4.9 Fast Recycle

By connecting the Print pulse (pin 19 of J1) to the External Reset (pin 44 of J1) and turning the DISPLAY TIME control to the EXT position, a very fast (approximately 30 microseconds) recycle time may be obtained.

3.4.10 Timing Diagram - Signals vs. Function

Diagrams showing the states of timing and control lines during the various modes of operation are given in the individual module manuals. These diagrams show the relationships among the pulses and signals generated in the 6300 Series Counting Unit and Function and Input Modules.

SECTION 4
MAINTENANCE

4.1 GENERAL

This section describes maintenance procedures to sustain operation of the Counting Unit. The information includes preventive maintenance, adjustments, and troubleshooting. Preventive maintenance encompasses the periodic cleaning and visual inspection necessary to detect physical defects. Occasionally adjustments are required for the power supply and oscillator. Troubleshooting involves basic troubleshooting procedures that enable the technician to correct equipment malfunctions.

4.2 PREVENTIVE MAINTENANCE

Preventive maintenance is work performed on the equipment, usually when the equipment is not in use, to keep it in good working order so breakdowns and needless interruptions will be kept to a minimum.

4.2.1 Cleaning

Proper cleaning of the equipment will aid in minimizing breakdowns or malfunctions. The following cleaning methods may be used as applicable.

a) A clean, dry, lint-free cloth; a dry brush; or a vacuum cleaner may be used to remove loose dust, dirt, and lint.

b) If available, dry compressed air at a line pressure not exceeding 30 psi may be used to remove dust from inaccessible places, provided that care is exercised to prevent transfer of dirt to nearby parts. Care must also be exercised to ensure that damage to components does not result from the air blast.

c) Corrosion should be removed with fine crocus cloth (No. 000). Emery paper or steel wool must never be used to clean near electrical equipment; the particles that come from such material are conductive and can create short circuits. All dust and metallic particles should be removed by compressed air or vacuum cleaning. If compressed air is used, prevent the scattering of particles to magnetic parts.

d) After corrosion is removed, the affected surface should be treated with paint and/or moisture-and-fungus resistant crylan.

e) Pure ethyl alcohol may be used to clean connector contacts and to remove excess rosin flux; it must not be used, however, to clean insulating varnish.

4.2.2 Visual Inspection

After cleaning the equipment, inspect carefully before restoring it into operation. The inspection should include the following:

a) Check the fuse, either visually or with an ohmmeter.

b) Ensure that the oscillator and glow tubes are securely in place.

c) Check all components for damaged leads and loose connections.

d) Check that switches have not been inadvertently placed to the wrong settings.

e) Check that rotation of the DISPLAY TIME control is smooth from extreme counter-clockwise to extreme clockwise.

f) Examine the printed circuit board and the components for signs of overheating.

g) Ensure that there is adequate air circulation for the equipment.

4.3 COVER REMOVAL

Simply remove the eight screws from the top cover and lift the cover off. This exposes the power supply, oscillator and Counting Unit board assemblies and components for ease in troubleshooting and making adjustments.

4.4 SERVICING INTEGRATED CIRCUITS

4.4.1 Special Troubleshooting Procedures

The following special troubleshooting procedures are recommended for instruments using integrated circuits.

1. Be sure that all line-operated test equipment have their ground terminals or chasses solidly and securely connected to instrument ground.
2. Use small pin-tipped test probes on meters and oscilloscopes to reduce the chance of shorting IC leads together.
3. Use the greatest care to avoid even a momentary short of any point in a circuit to ground or to other circuit points.
4. Do not allow "dangling" oscilloscope probe ground leads, or other stray leads, to touch circuitry in the instrument.
5. Unplug the line cord before removing, replacing or soldering components.

4.4.2 Removing Integrated Circuit Modules

A recommended method for removing integrated circuit modules is given below.

1. Note position of the IC indexing point.
2. Carefully cut the leads from the IC with small, diagonal cutting pliers.
3. Use a low-temperature soldering iron (no more than 40W) to remove each IC lead from the circuit board. Use just enough heat to melt the solder, and remove each IC lead with small long-nose pliers or tweezers. If necessary, use a SOLDA-PULLT® desoldering tool to clear the holes of excess solder.

CAUTION

Extreme care should be exercised in all phases of servicing instruments containing semiconductors, especially when integrated circuits are involved. In general, for IC replacement, return the instrument to Beckman's Service Department. If this is impractical, carefully read paragraphs 4.4.1 through 4.4.3 before attempting any troubleshooting or repair work.

In removing defective integrated circuits, be very careful not to cause damage to the circuit board. The cost of the IC is small in comparison, and no attempt should be made to remove the part intact when it may result in damage to the parent board.

When installing the replacement component, make sure the part is correctly oriented and all leads are inserted into the proper holes of the circuit board before soldering.

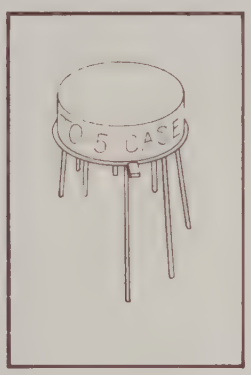
4.4.3 Installing Integrated Circuit Modules

To install the integrated circuit modules, follow these recommended procedures.

1. Replace with correct type.

2. Make sure the indexing point of the new IC is in the same position as the previous one.

3. With the TO-5 cased IC, cut leads in a stair-step fashion starting at the tab as shown. Insert leads into the board one at a time.



4. With the inline-cased IC, insert the leads on one side part way into the board first, and then insert the other side.

5. Make sure that all the leads are in the correct holes of the board, and not bent under the case.

6. Carefully solder each lead, using a low-temperature soldering iron.

7. If necessary, trim excess leads on the wire side of the board.

8. If the instrument has integrated circuits mounted in sockets, care must be used when replacing the IC in the socket. Make sure that each lead is properly started into the correct socket receptacle before pushing the IC into place. This prevents damage to either the IC or socket.

4.5 ADJUSTMENTS

4.5.1 Power Supply

Figure 4-1 shows the potentiometers of the regulated power supply. Proceed as follows when making these adjustments:

a) Monitor the +5 volt test point.

b) Adjust potentiometer R8 to obtain +5 (±1%) volts.

c) Monitor the +15 volt test point.

d) Adjust potentiometer R17 to obtain +15 (±1%) volts.

e) Monitor the -6 volt test point.

f) Adjust potentiometer R25 to obtain -6 (±1%) volts.

4.5.2 Oscillator

Oscillator adjustments are seldom required. When necessary, contact the factory.

4.6 TROUBLESHOOTING

This is a complex electronic instrument, and there is no simple way of locating troubles. A thorough understanding of the functions of the logic circuits is the best help (see Section 3, "Principles of Operation"). The signal flow is shown in the block diagram; timing and control signals are illustrated in Figure 3-10. Waveform photographs are given in Table 4-1, using a Model 675 Function Module and a Model 683 Input Module. With an understanding of the circuits, a technician should be able to make a reasonable assumption as to the general source of trouble based on the symptoms.

Frequently, a visual inspection and a systematic approach to the troubleshooting problem may be more rewarding than a haphazard check of voltages and waveforms. The following instructions are presented as an aid in formulating the systematic approach.

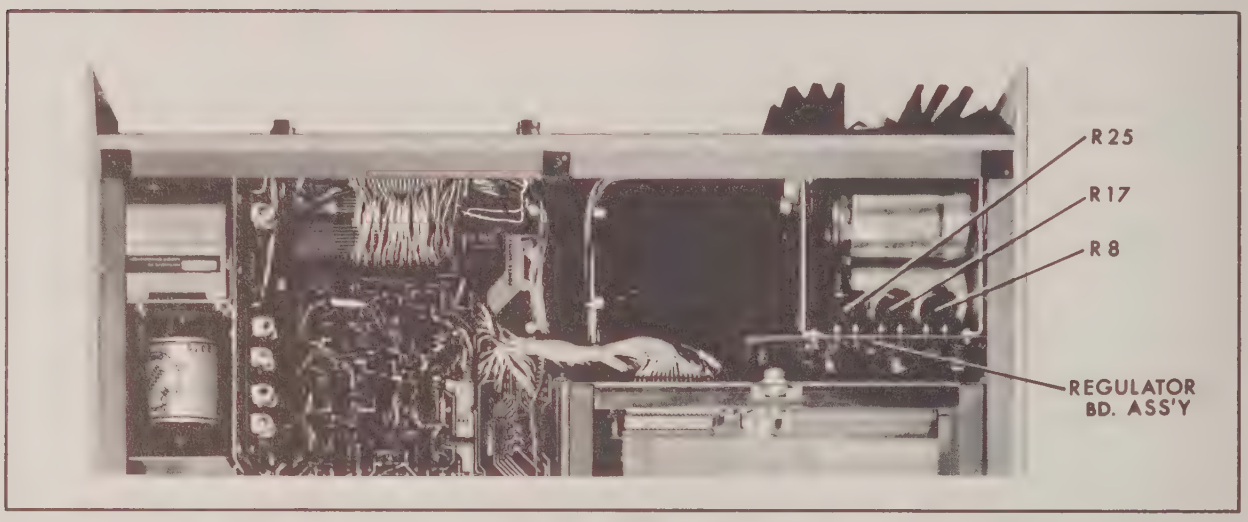


FIG. 4-1. Power Supply Adjustments.

Table 4-1. Waveforms

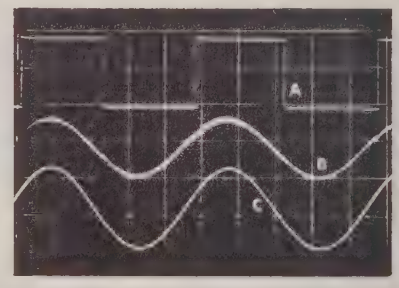
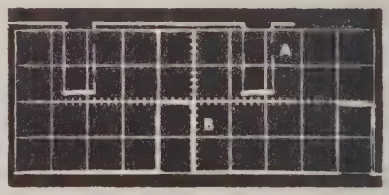
CONDITIONS

UNIT ENERGIZED*
DISPLAY TIME to FAST RECYCLE
(See paragraph 3.4.9)

Equipment needed:
Tektronix Models 585A and
82 Dual Trace Plug-In

CAUTION

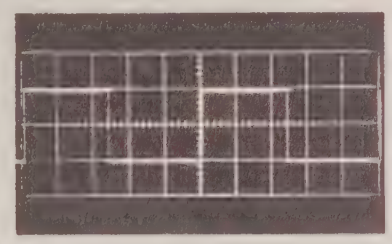
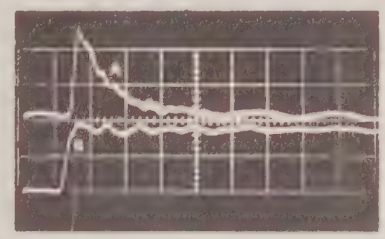
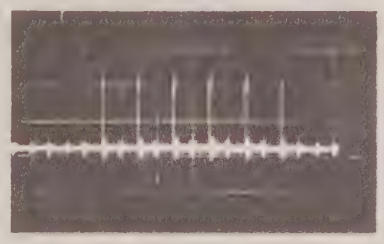
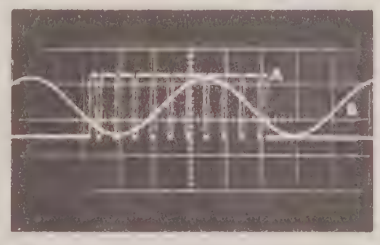
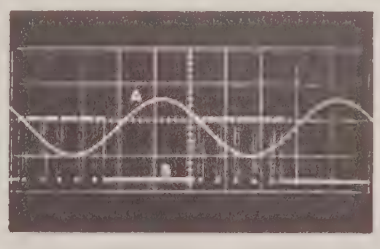
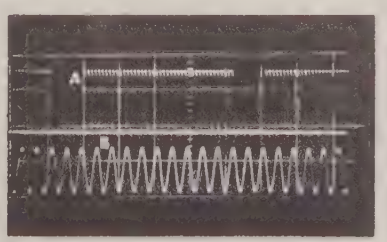
To minimize the possibility of shorts when probing integrated circuits, turn the unit power off before relocating scope probe. After the probe is in its new location, the power may be turned on. Allow a few seconds for the waveform to stabilize.

LOCATION	SIGNAL	TEST POINT	SCOPE LEGEND	FREQUENCY	WAVEFORM
INPUT MODULE	A) Pulse Shaper Output B) First IC Output C) Input Signal	CR10 (Input) Z1 Pin 7	2.0 volts/cm 0.2 ms/cm 0.5 volt/cm 0.2 ms/cm 0.2 volt/cm 0.2 ms/cm	1000 Hz 1000 Hz 1000 Hz	
	Shaped Pulses: Extreme settings of trigger pot to allow illumination of trigger lamps.	CR10 (Input)	A) 2.0 volts/cm 0.2 ms/cm B) 2.0 volts/cm 0.2 ms/cm	1000 Hz 1000 Hz	

*Unit Configuration: Model 6380 Counting Unit with
675 Function Module
683 Input Module

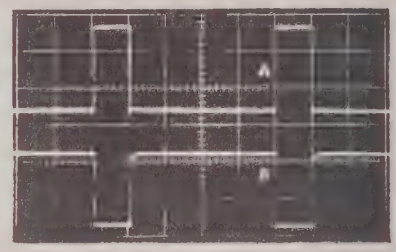
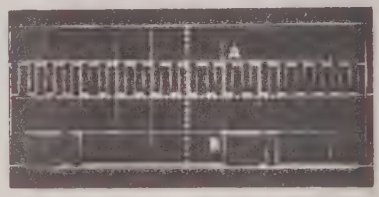
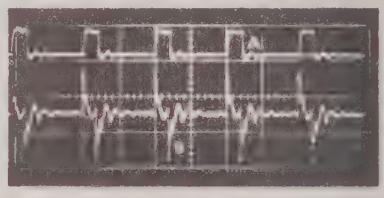
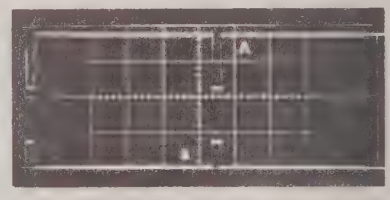
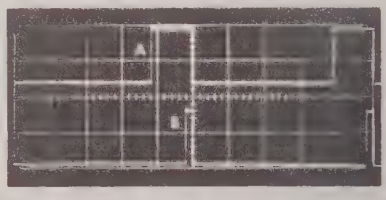
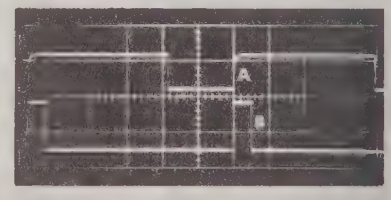
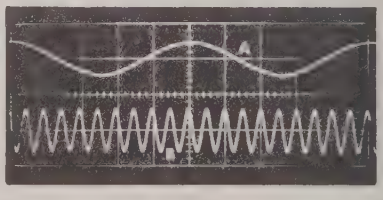
. . . continued

Table 4-1. Waveforms (continued)

LOCATION	SIGNAL	TEST POINT	SCOPE LEGEND	FREQUENCY	WAVEFORM
INPUT MODULE continued	Shaped Pulses: Optimized settings of trigger pot allows equal pulse width for a sinusoidal signal.	CR10 (Input)	2.0 volts/cm 0.2 ms/cm	1000 Hz	
	Signals at Coupling Capacitor: A) Differentiated Signal Out. B) Input Pulse	C10 (Output) (Input)	1.0 volt/cm 0.05 μs/cm 2.0 volts/cm 0.05 μs/cm	1000 Hz 1000 Hz	
	DCU (Display) Unit for FREQ Function. Periods/Count, 10 μs TB, 50 μs Delay	Z5 Pin 8	2.0 volts/cm 2.0 μs/cm (Trigger off) C10	503.850 KHz	
	A) PERIOD X1 SLOPE (-) (-) Timing Pulses per period with 1 μs TB B) Input Signal	Z5 Pin 8	A) 2.0 volts/cm 20. μs/cm B) 2.0 volts/cm 20. μs/cm	10 KHz	
	A) PERIOD X1 SLOPE (-) (+) Timing pulses 10 μs TB B) Input Signal	Z5 Pin 8	A) 2.0 volts/cm 20. μs/cm B) 2.0 volts/cm 20. μs/cm	10 KHz	
	A) PERIOD X10 Timing Pulses per 10 periods 10 μs TB B) Input Signal	Z5 Pin 8	A) 2 volts/cm 0.1 ms/cm B) 2 volts/cm 0.1 ms/cm	23.774 KHz	

. . . continued

Table 4-1. Waveforms (continued)

LOCATION	SIGNAL	TEST POINT	SCOPE LEGEND	FREQUENCY	WAVEFORM
FUNCTION MODULE	A) TB Output B) TB/SCALE OUT (Front Panel)	Z19 Pin 8	A) 2 volts/cm 20 μs/cm B) 2 volts/cm 20 μs/cm	10 KHz	
	PERIOD X10 DCU Bank	A) Z22 Pin 9 (Input) B) Z19 Pin 6 (Output)	0.5 volt/cm 20 μs/cm 5.0 volts/cm 20 μs/cm	100 KHz	
6300 COUNTING UNIT	A) $\overline{\text{Start}}$ 1 μs TB B) Differentiated Start Pulse 1 μs TB	Z21 Pin 8 Function Unit Z1 Pin 12	5.0 volts/cm 0.5 μs/cm 5.0 volts/cm 0.5 μs/cm		
	For FAST RECYCLE: A) GATE Pulse 1 ms TB B) Start Pulse (Differentiated and shaped)	Z1 Pin 8 Z1 Pin 12	2.0 volts/cm 0.2 ms/cm 2.0 volts/cm 0.2 ms/cm		
	A) $\overline{\text{Print}}$ Pulse B) Store Pulse	Z4 Pin 3 Z3 Pin 3	2 volts/cm 10 μs/cm 2 volts/cm 10 μs/cm		
	A) $\overline{\text{Display}}$ Pulse B) Reset Pulse	Z7 Pin 8 Z6 Pin 13	5 volts/cm 10 μs/cm 2 volts/cm 10 μs/cm		
6300 COUNTING UNIT FUNCTION MODULE	INTERNAL OSCILLATOR: A) 1 MHz Signal B) 10 MHz Signal	J3 Rear Conn. Pin 20	5 volts/cm 0.2 μs/cm 2 volts/cm 0.2 μs/cm		

4.6.1 Basic Troubleshooting Procedures

In troubleshooting electronic equipment, sources of problems can be divided into two categories: improper operating procedures and equipment malfunctions. The first category, since it deals with human error, is a more prevalent source of equipment problems than most people care to admit. Therefore, this category should always be investigated and eliminated before it is assumed that a valid equipment malfunction exists. After eliminating all possibility of human error, an equipment malfunction can, with assurance, be systematically attacked. It is vitally important to define the problem before attempting to solve it. The basic procedure consists of the following steps:

① Examine the evidence of trouble.

② Look for obvious solutions first.

③ Isolate the problem to a major functional area.

④ Analyze the reduced problem area for final solution.

⑤ Correct the difficulty.

⑥ Restore conditions for normal operation.

① Examine Evidence of Trouble

Take time to study the problem thoroughly. For example, if the display indicates erroneous information, note whether the trouble is general or whether the error applies to one or two decades only. Examine the data reaching the display; it should be in agreement with the data on the storage register. Gather clues from all accessible check points:

a) TEST mode operation; TRIGGER lights on Input Plug-In Module; GATE indicator.

b) The visual display.

c) Circuit board test points.

d) Printed records from the line printer (when used).

In evaluating indications from the various checkpoints, determine particularly whether a disagreement exists between various related functions.

② Look for Obvious Solutions First

Question the coincidence of failure with other recent events, such as cleaning or servicing. Human errors sometimes result in accidentally displaced control settings. Consider also the possibility of miscellaneous simple failures, such as the plug-in modules not fully inserted. Quite often the solution to a difficulty will become self-evident through thoughtful analysis of immediate indications.

③ Isolate Problem to a Major Functional Area

Although the equipment is an integrated network of functional activities, for troubleshooting purposes it is convenient to subdivide it into its major functional circuits. (See Figure 4-2 for location.) To locate various components, see the individual assembly drawings in Section 5. The block diagram, Figure 3-1, shows the various functional sections. These can be classified as follows:

- Power circuits.
- Timing and control circuits.
- Counting circuits.
- Storage circuits.
- Decoder and display circuits.

As the troubleshooter develops a working knowledge of the overall equipment, he will experience little difficulty with this isolation step.

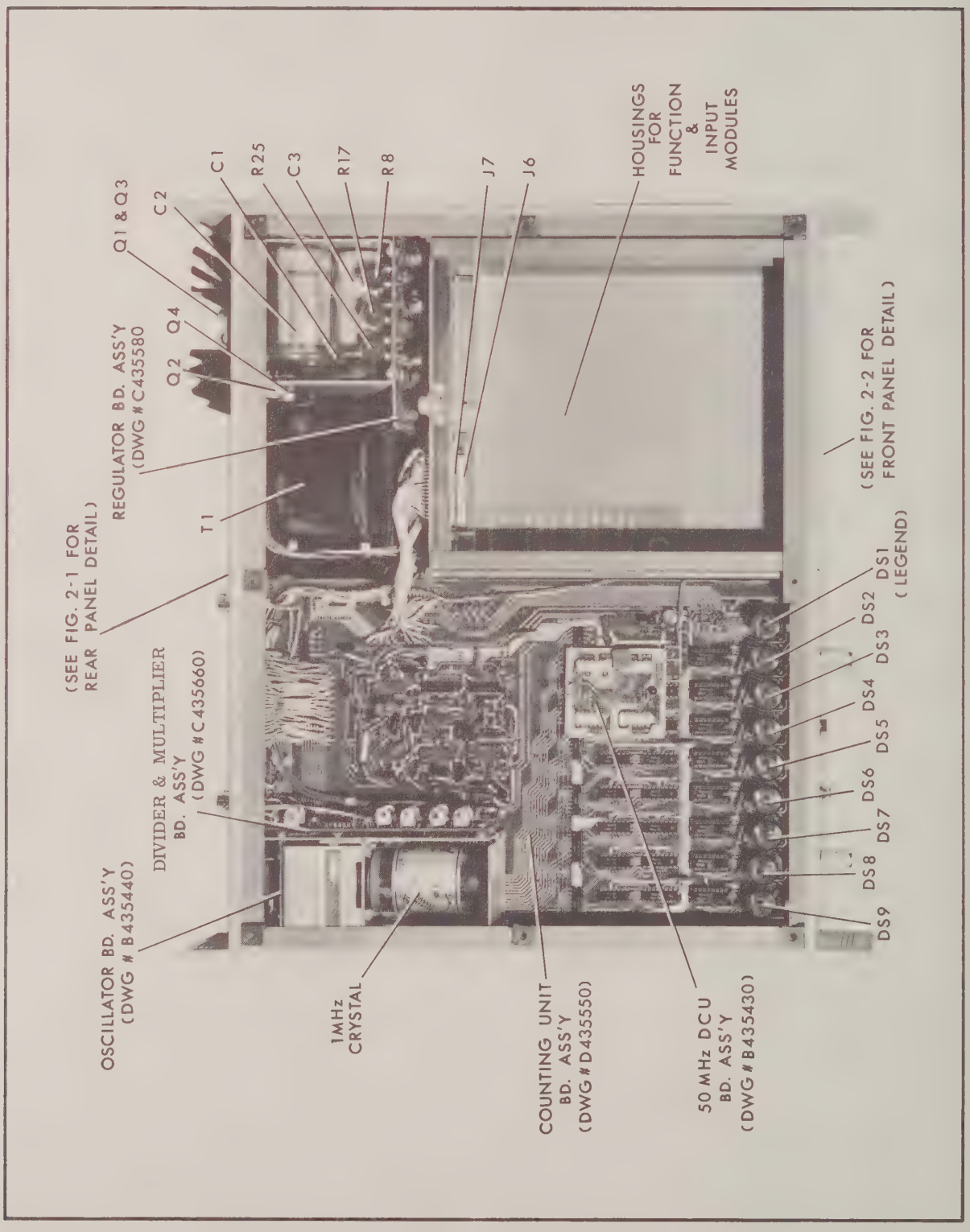


FIG. 4-2. Model 6380 - Top View with Cover Removed.

Isolating the disorder to an individual functional circuit can be accomplished either by a method of direct association or through a process of elimination.

④ Analyze Reduced Problem Area for Final Solution

Once the investigation has been narrowed down to a restricted circuit area, the rest of the unit can be temporarily ignored.

⑤ Correct the Difficulty

When the final solution has been reached, and the defective or faulty part has been pinpointed, remedy the fault by replacing the component as required. Some remedies, however, may call for performing a repair on one of the relatively few assemblies that is not designed for instant removal and replacement. Typical of these items is a break in the circuit board etching.

⑥ Restore Conditions for Normal Operation

When all remedies have been completed, make sure that the unit is returned to normal operating condition. If controls have been changed to facilitate troubleshooting, reset them. Note particularly that all circuit board components are in and secured, and all switches are set properly.

4.7 REPAIR

Once a trouble is traced to a defective individual part, replacement should be made with identical parts, if practical. Refer to the drawings in Section 5 for correct values, tolerances, etc. When substitutions are necessary, use components that duplicate the originals in every possible respect. Avoid applying excessive heat to the printed circuit board by using a small iron and working quickly.

SECTION 5
PARTS LISTS & DIAGRAMS

5.1 GENERAL

The parts list for each individual board is located with its associated component assembly and schematic or logic diagrams. This facilitates the location and ordering information of defective parts. Some miscellaneous chassis and hardware parts are listed with the Mechanical and Wired Assembly.

PARTS LISTS AND DIAGRAMS

	Dwg. No.	Page
Counting Unit Parts List (6300 Series)		5-2
Model 6360 Counting Unit Component Assembly Diagram	D435530 (C)	5-4
Model 6360 Logic Diagram	E435449 (C)	5-5
Model 6370 Counting Unit Component Assembly Diagram	D435540 (C)	5-6
Model 6370 Logic Diagram	E435456 (C)	5-7
Model 6380 Counting Unit Component Assembly Diagram	D435550 (C)	5-8
Model 6380 Logic Diagram	E435462 (C)	5-9
Timing Module "AA" Parts List		5-10
Timing Module "AA" Assembly Diagram	C435639 (A)	5-11
Timing Module Logic Diagram	D435638 (C)	5-12
1 MHz Oscillator Board "AA" Parts List		5-13
1 MHz Oscillator Component Assembly Diagram	B435440 (A)	5-14
1 MHz Oscillator Schematic Diagram	B435427 (A)	5-15
Divider and Multiplier Board Assembly Parts List		5-16
Divider and Multiplier Board Assembly Diagram	C435660 (C)	5-17
50 MHz DCU Board Assembly Parts List and Diagram	B435430 (A)	5-18
50 MHz DCU Logic Diagram	C435419 (A)	5-19
Power Supply Parts List		5-20
Power Supply Assembly Diagram	D435589 (A)	5-21
Regulator Board Assembly Parts List		5-22
Regulator Board Assembly Diagram	C435580 (B)	5-23
Power Supply Schematic Diagram	D435578 (B)	5-24
Miscellaneous Parts List		5-25
Mechanical and Wired Assembly Diagram (6380)	D435459 (B)	5-26

PARTS LIST

MODEL 6360 COUNTING UNIT

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	*D855-435530(C)	P.C. Ass'y, Counting Unit (6360)	Beckman	1
A1	855-435430	P.C. Ass'y, 50 MHz DCU	Beckman	1
C1, 2	637-822771	Capacitor, F. Mica, 82pf, 500V, 5%	Electromotive DM-5-E820J0-500WV5CR	2
C3, 4, 10, 17, 22, 23	633-815873	Capacitor, F. Cerm., 0.33μf, 25V, -20 +80%	Sprague 5C10A	6
C5	637-822986	Capacitor, F. Mica, 220pf, 500V, 5%	Electromotive DM15-F221J0-500WV4CR	1
C6, 7	637-825348	Capacitor, F. Mica, 300pf, 500V, 5%	Electromotive DM15-F301J0-500WV4CR	2
C8, 12, 14, 18, 21, 24	637-822251	Capacitor, F. Mica, 100pf, 500V, 5%	Electromotive DM15-F101J0-500WV4CR	6
C9, 19	631-814054	Capacitor, F. Tant., 22μf, 35V, ±20%	Sprague 150D226X-0035R2	2
C11	633-810249	Capacitor, F. Mica, 0.0033μf, 1KV, 1GMV	Centralab DD-332	1
C13	633-835133	Capacitor, F. Cerm., 0.068μf, 25V, 20%	Sprague 3C023683X-0250A3	1
C15, 20	633-836864	Capacitor, F. Cerm., 0.01μf, 50V, -20 +80%	Sprague 19C214A6/TG-S10	2
C16	637-826136	Capacitor, F. Mica, 120pf, 500V, 5%	Electromotive DM15-F121J0-500WV4CR	1
CR1	755-402107	Diode, Special	Beckman	1
#CR2 thru CR39	755-845049	Diode, FDH627	Fairchild	38
CR52 thru CR56	755-420893	Diode, Special	Beckman	5
J1	697-435609	Connector and Wire Part	Beckman	1
Q1	755-846287	Transistor, 2N3877A	General Electric	1
Q2, 4, 5	755-857274	Transistor, 2N4275	Fairchild	3
Q3	755-425735	Transistor, Special	Beckman	1
Q6	755-817964	Transistor, 2N1420	Texas Instruments	1
R1, 2, 15, 16, 21, 25, 26, 55, 56	601-823395	Resistor, F. Comp., 470Ω, 1/4W, 5%	**AB CB4715	9
R3, 4, 5, 6, 7, 8, 10, 12, 17, 22, 30, 32, 34, 51, 52	601-822299	Resistor, F. Comp., 6.8K, 1/4W, 5%	AB CB6825	15
R9	601-822369	Resistor, F. Comp., 680Ω, 1/4W, 5%	AB CB6815	1
R11, 42	601-823902	Resistor, F. Comp., 47K, 1/4W, 5%	AB CB4735	2
R13, 27, 33, 38	601-822460	Resistor, F. Comp., 3.9K, 1/4W, 5%	AB CB3925	4
R14, 19, 37, 41	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	AB CB1025	4

*855-435540(C) - 6370
855-435550(C) - 6380

#Model 6370: CR2 thru 43 (Qty. 42)
Model 6380: CR2 thru 47 (Qty. 46)

. . . continued

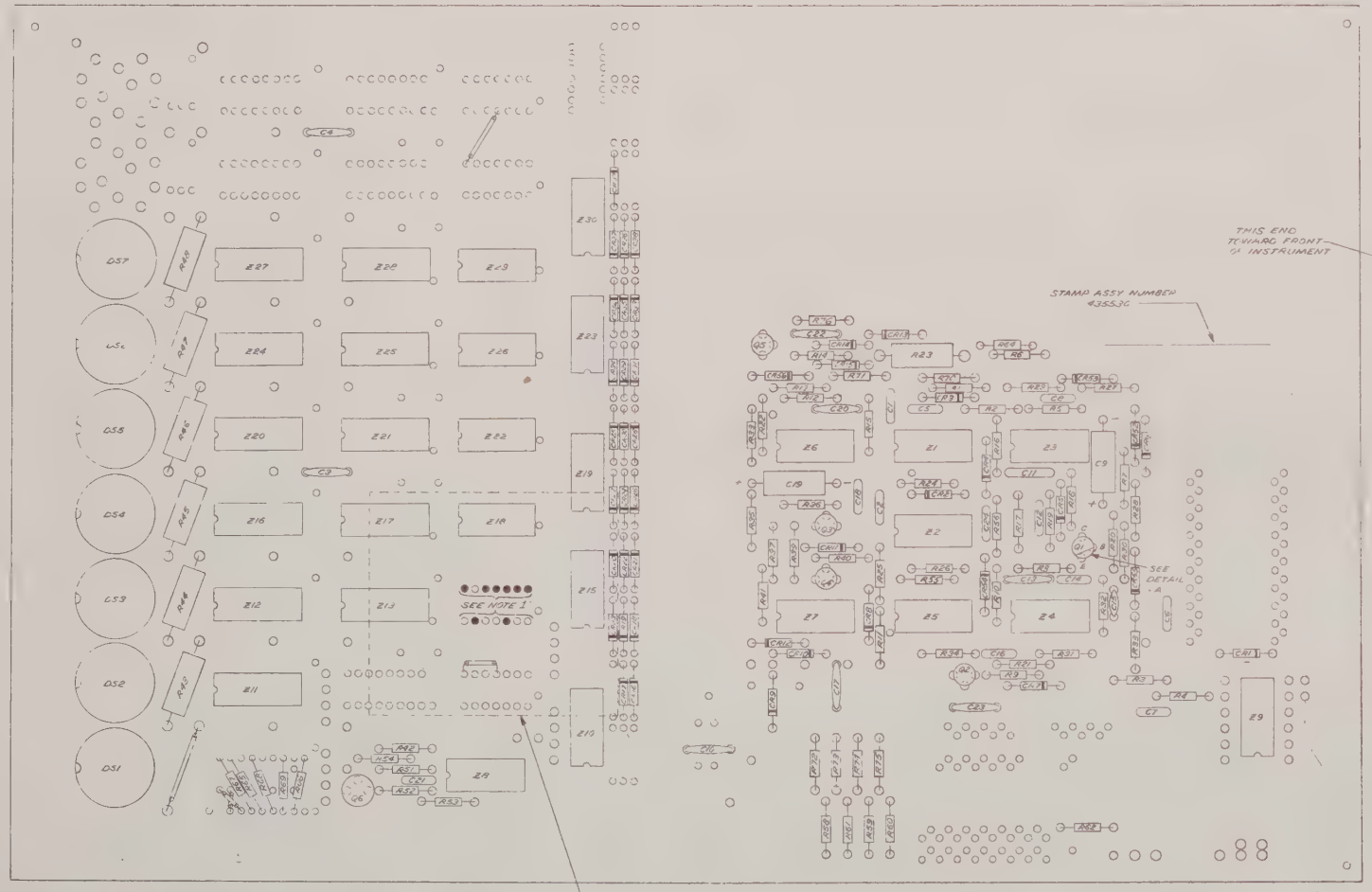
**Allen Bradley

PARTS LIST - MODEL 6360 COUNTING UNIT (Continued)

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
R18	601-823391	Resistor, F.Comp., 150Ω, 1/4W, 5%	AB CB1515	1
R20	601-823904	Resistor, F.Comp., 100K, 1/4W, 5%	AB CB1045	1
R23	601-800046	Resistor, F.Comp., 120Ω, 1W, 5%	AB GB1215	1
R24, 70	601-822334	Resistor, F.Comp., 22K, 1/4W, 5%	AB CB2235	2
R28, 59, 60, 61, 64	601-822324	Resistor, F.Comp., 10K, 1/4W, 5%	AB CB1035	5
R29, 31	601-822295	Resistor, F.Comp., 2.7K, 1/4W, 5%	AB CB2725	2
R35	601-822297	Resistor, F.Comp., 4.7K, 1/4W, 5%	AB CB4725	1
R36, 76	601-823384	Resistor, F.Comp., 27Ω, 1/4W, 5%	AB CB2705	2
R39	601-822296	Resistor, F.Comp., 3.3K, 1/4W, 5%	AB CB3325	1
R40	601-823912	Resistor, F.Comp., 470K, 1/4W, 5%	AB CB4745	1
*R43, 44, 45, 46, 47, 48	601-043208	Resistor, F.Comp., 8.2K, 1W, 5%	AB GB8225	6
R53	601-822327	Resistor, F.Comp., 220Ω, 1/4W, 5%	AB CB2215	1
R54, 62	601-823379	Resistor, F.Comp., 10Ω, 1/4W, 5%	AB CB1005	2
R58, 65, 66, 67, 68, 69	601-822301	Resistor, F.Comp., 15K, 1/4W, 5%	AB CB1535	6
R71	601-817735	Resistor, F.Comp., 100Ω, 1/4W, 5%	AB CB1015	1
R72, 73, 74, 75	601-823916	Resistor, F.Comp., 1M, 1/4W, 5%	AB CB1055	4
Z1, 2	885-435911	I.C., Quad 2 Input Gate	Beckman	2
Z3, 4, 6, 8	885-435206	I.C., Quad 2 Input Gate	Beckman	4
Z5	885-435208	I.C., Quad 2 Input Gate	Beckman	1
Z7	885-435207	I.C., Dual 4 Input Expand	Beckman	1
*Z9, 10, 15, 19, 23, 30	885-435255	I.C., Hex 1 Input Gate	Beckman	6
*Z11, 12, 16, 20, 24, 27	885-435191	I.C., BCD-to-Decimal Decoder	Beckman	6
*Z13, 17, 21, 25, 28	885-435254	I.C., Quad-Bistable Latch	Beckman	5
*Z18, 22, 26, 29	885-435168	I.C., Decade Counter, 10 MHz	Beckman	4
* XDS1 thru XDS7	860-857331	Socket, Readout	National RTS-29	7

*NOTE: Parts are identical for Models 6360, 6370, and 6380 except as noted below.

Detail No.	Model 6370	Qty.	Model 6380	Qty.
R43 thru 48	Add R49	7	Add R49 & 50	8
Z9, 10, 15, 19, 23, 30	Add Z34	7	Add Z34	7
Z11, 12, 16, 20, 24, 27	Add Z31	7	Add Z31 & 35	8
Z13, 17, 21, 25, 28	Add Z32	6	Add Z32 & 36	7
Z18, 22, 26, 29	Add Z33	5	Add Z33 & 37	6
XDS1 thru 7	Add XDS8	8	Add XDS 8 & 9	9



NOTE

1- CUT 8 LENGTHS OF 22 AWG BARE WIRE (1.56 LONG), USE TEFLON SLEEVING (.31 LONG) ON EACH WIRE. INSERT WIRE & SLEEVING INTO PWB HOLDING JIG, WITH .12 IN WIRE EXTENDING PLACE ON BOARD AS SHOWN. AFTER DIP SOLDERING, HAND SOLDER A1, 50 MHz OCXO, IN PLACE

● DENOTES HOLES THAT WIRES ARE TO BE INSERTED INTO

2- ALL JUMPERS 22AWG WITH TEFLON SLEEVING

ZONE	LTR	DESCRIPTION	ECO NO.	DATE	BY	CHK'D
	B	FINAL RELEASE	——	11/67	LW	LW
	C	SEE E.C.O	1207334468	3-8-71	LW	LW

QTY	PART NO	DESCRIPTION	REF DES
2	A405-435418	JIG, PIN HOLDING	REF
1	A03-435529	PARTS LIST 6360 COUNTING UNIT	1

UNLESS OTHERWISE SPECIFIED

TOLERANCES

APPLICATION

DRAWN A. SHIRGUR 6-67

CHK'D A. HARPEN 11-67

ENGR H. VINSON 3-71

TITLE: BOARD ASSY, 6360 COUNTING UNIT

Beckman INSTRUMENTS, INC. ELECTRONIC INSTRUMENTS DIVISION

MATERIAL

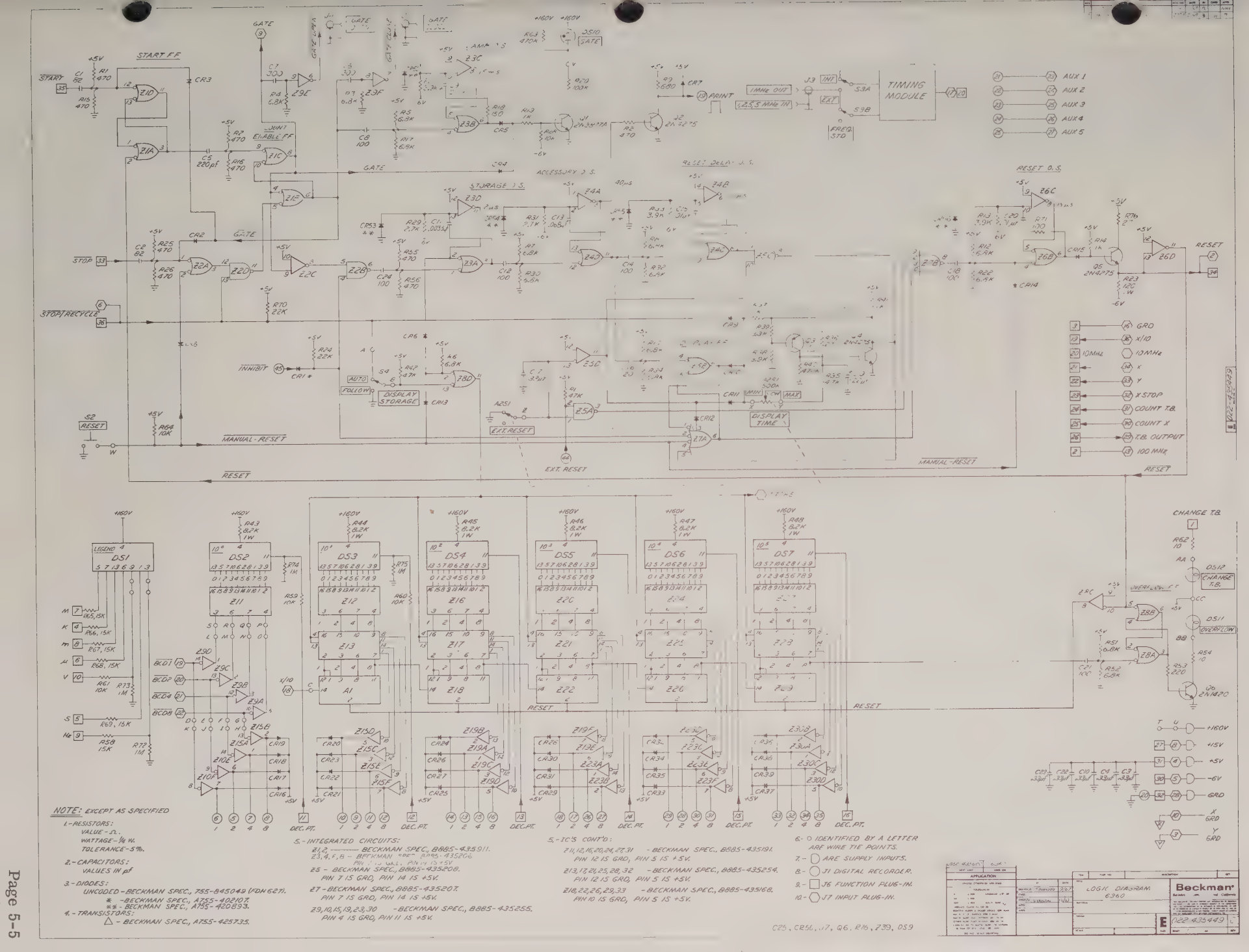
FINISH

SCALE 2/1

SIZE D

655-435530 C

SHEET 1 OF 1



NOTE: EXCEPT AS SPECIFIED

1.- RESISTORS:
VALUE - Ω.
WATTAGE - 1/4 W.
TOLERANCE - 5%.

2.- CAPACITORS:
VALUES IN pf

3.- DIODES:
UNCODED - BECKMAN SPEC., 755-845049 (FDH 627).
* - BECKMAN SPEC., A755-402107.
** - BECKMAN SPEC., A755-420893.

4.- TRANSISTORS:
△ - BECKMAN SPEC., A755-425735.

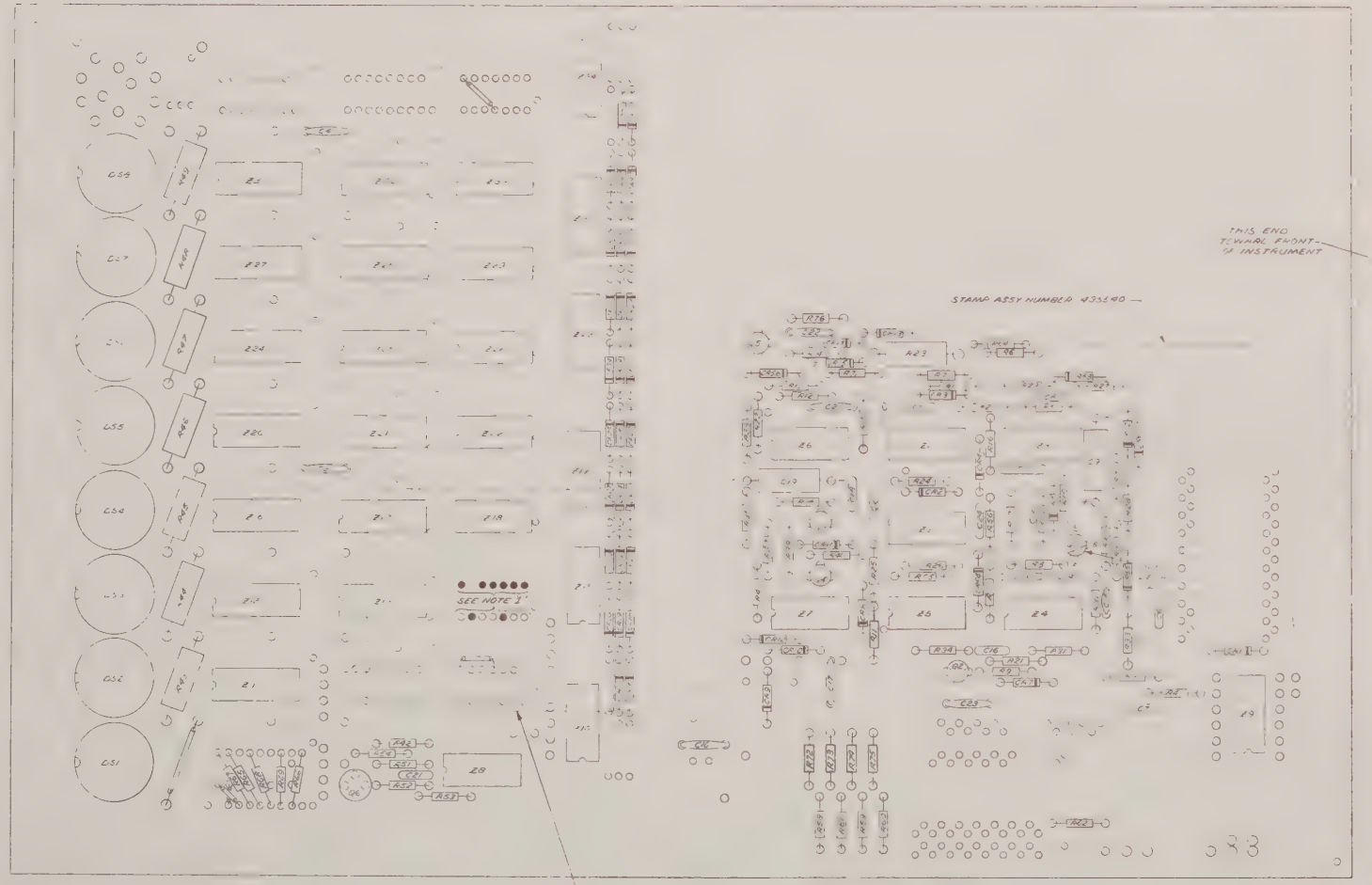
5.- INTEGRATED CIRCUITS:
Z1,2 ——— BECKMAN SPEC., B885-435911.
Z3,4,F,B - BECKMAN SPEC., B885-435206
PIN 7 IS GRD, PIN 14 IS +5V.
Z5 - BECKMAN SPEC., B885-435208.
PIN 7 IS GRD, PIN 14 IS +5V.
Z7 - BECKMAN SPEC., B885-435207.
PIN 7 IS GRD, PIN 14 IS +5V.
Z9,10,15,19,23,30 - BECKMAN SPEC., B885-435255.
PIN 4 IS GRD, PIN 11 IS +5V.

5.- IC'S CONT'D:
Z11,12,16,20,24,27,31 - BECKMAN SPEC., B885-435191.
PIN 12 IS GRD, PIN 5 IS +5V.
Z13,17,21,25,28,32 - BECKMAN SPEC., B885-435254.
PIN 12 IS GRD, PIN 5 IS +5V.
Z18,22,26,29,33 - BECKMAN SPEC., B885-435168.
PIN 10 IS GRD, PIN 5 IS +5V.

6.- ○ IDENTIFIED BY A LETTER ARE WIRE TIE POINTS.
7.- ◯ ARE SUPPLY INPUTS.
8.- ◯ J1 DIGITAL RECORDER.
9.- □ J6 FUNCTION PLUG-IN.
10.- ⬡ J7 INPUT PLUG-IN.

C25, CR56, J7, Q6, R76, Z39, DS9

APPLICATION
LOGIC DIAGRAM
6360
Beckman
E
022 435449



NOTE

1- CUT 8 LENGTHS OF 22 AWG BARE WIRE (.56 LONG). USE TEFLON SLEEVING (.31 LONG) ON EACH WIRE INSERT WIRE & SLEEVING INTO AM HOLDING JIG, WITH .12 IN WIRE EXTENDING PLACE ON BOARD AS SHOWN. AFTER DIP SOLDERING, HAND SOLDER A1, 50 MHz OCU, IN PLACE.

● DENOTES HOLES THAT WIRES ARE TO BE INSERTED INTO.

2- ALL JUMPERS 22AWG WIRE WITH TEFLON SLEEVING

REV	DESCRIPTION	NO. IN	IN	BY	CHK'D	APP
B	FINAL RELEASE	—	—	—	—	—
C	SEE E.C.O.	12073/4668	SAT	L W		

2	A905 435418	JIG, PIN HOLDING	AER
1	A037-435539	PARTS LIST 6370 COUNTING UNIT	1
ITEM	PART NO.	DESCRIPTION	QTY

DRAWN	K Shimada 2-67
TRACED	WARREN 1-67
ENGR	N WINSOR 4-67
APPR	
MATERIAL	
FINISH	
SCALE	3/1

BOARD ASSY, 6370 COUNTING UNIT

Beckman® INSTRUMENTS, INC. ELECTRONIC INSTRUMENTS DIVISION

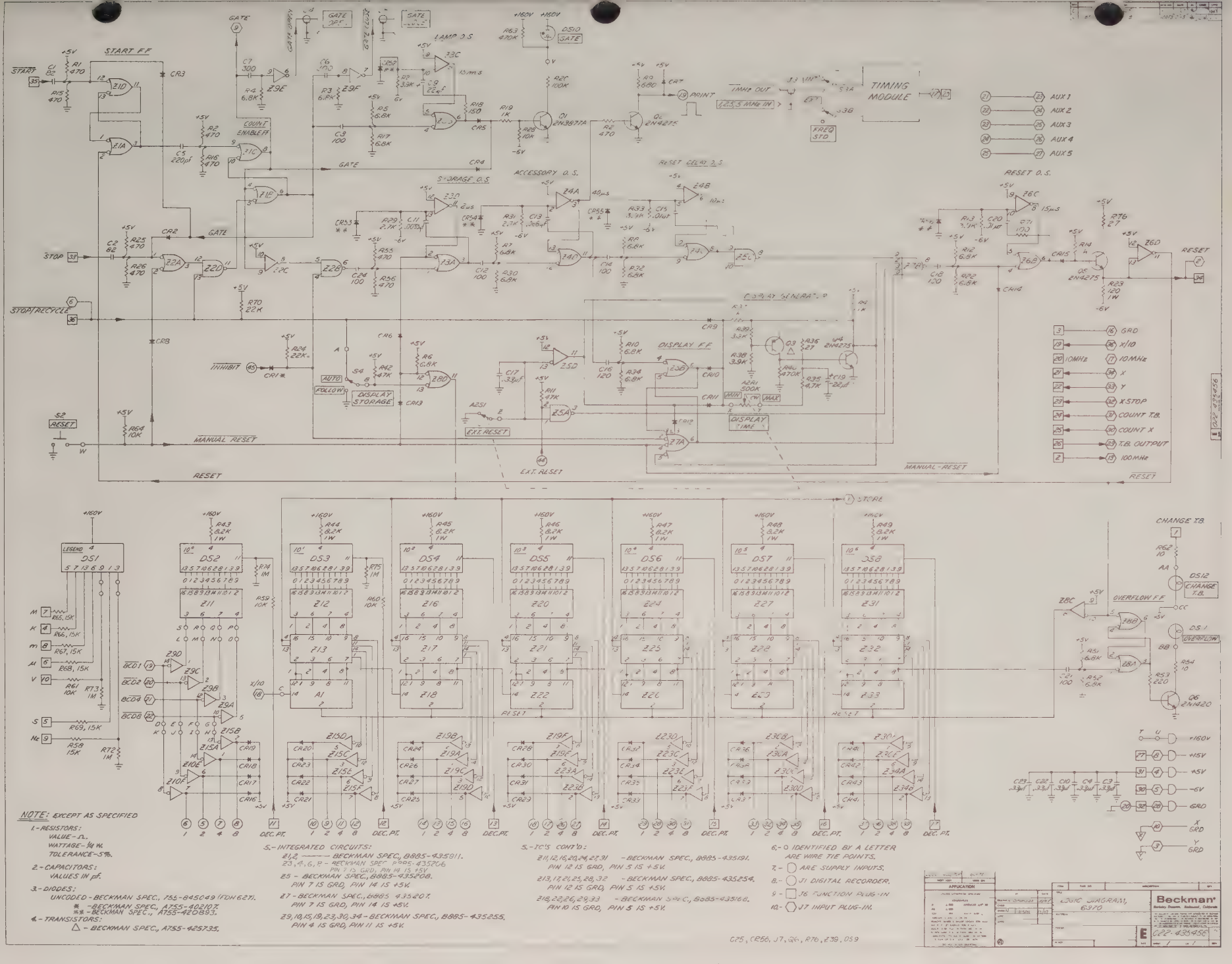
D 855-435540 C

SHEET 1 OF 1

ABES-435540 6370	
NEXT ASSY	USED ON
APPLICATION	

DO NOT SCALE DRAWING

855-435540



NOTE: EXCEPT AS SPECIFIED

1.- RESISTORS:
VALUE - Ω.
WATTAGE - ¼ W.
TOLERANCE - 5%.

2.- CAPACITORS:
VALUES IN pf.

3.- DIODES:
UNCODED - BECKMAN SPEC., 755-845049 (FOR 627).
* - BECKMAN SPEC., A755-402107.
** - BECKMAN SPEC., A755-420893.

4.- TRANSISTORS:
△ - BECKMAN SPEC., A755-425735.

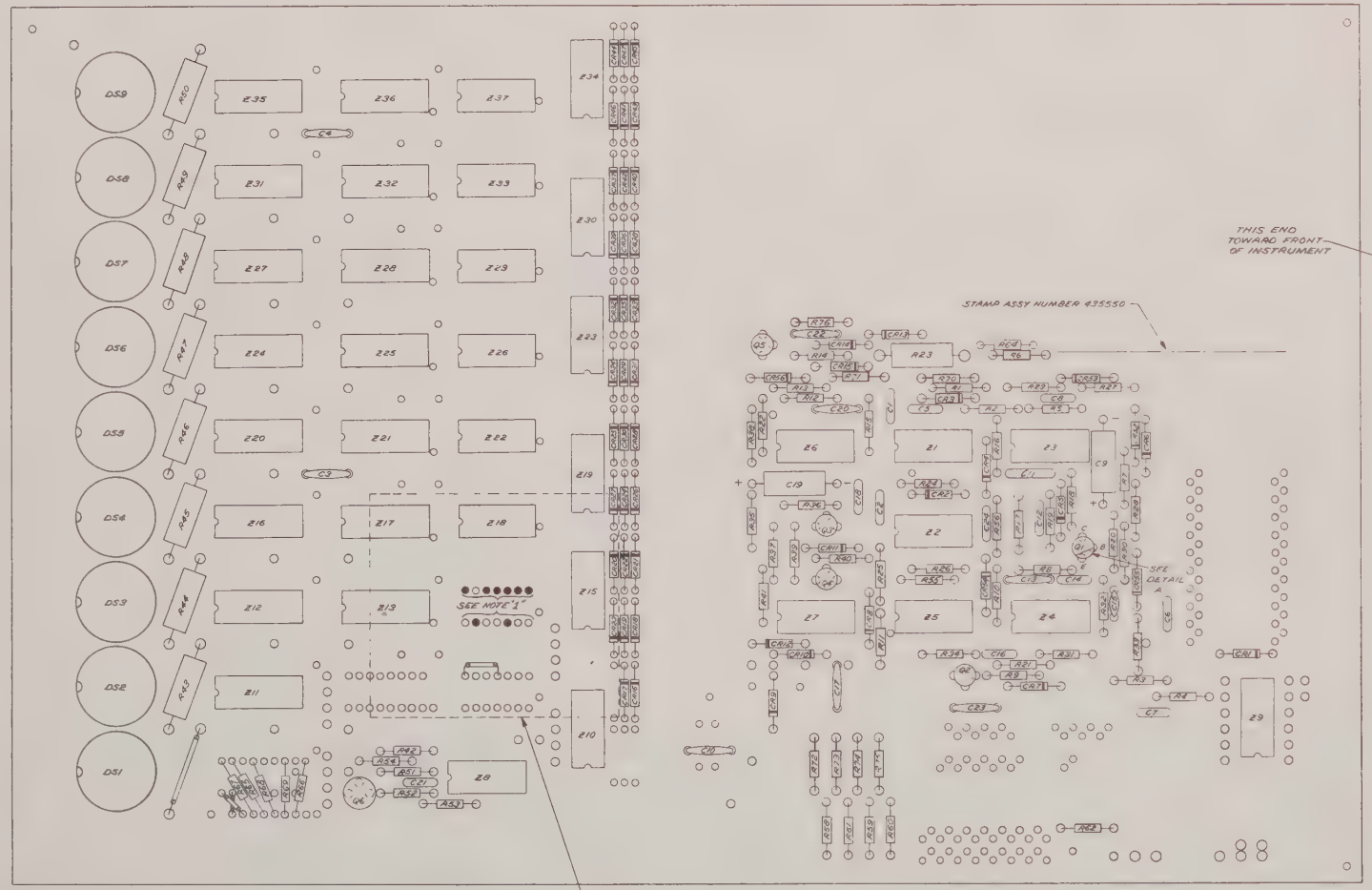
5.- INTEGRATED CIRCUITS:
Z1,2 ——— BECKMAN SPEC., B885-435911.
Z3,4,6,9 - BECKMAN SPEC. P/NOS. 435206
PIN 7 IS GRD, PIN 14 IS +5V.
Z5 - BECKMAN SPEC., B885-435208.
PIN 7 IS GRD, PIN 14 IS +5V.
Z7 - BECKMAN SPEC., B885 435207.
PIN 7 IS GRD, PIN 14 IS +5V.
Z9,10,15,19,23,30,34 - BECKMAN SPEC., B885-435255.
PIN 4 IS GRD, PIN 11 IS +5V.

5.- IC'S CONT'D:
Z11,12,16,20,24,27,31 - BECKMAN SPEC., B885-435191.
PIN 12 IS GRD, PIN 5 IS +5V.
Z13,17,21,25,28,32 - BECKMAN SPEC., B885-435254.
PIN 12 IS GRD, PIN 5 IS +5V.
Z18,22,26,29,33 - BECKMAN SPEC., B885-435166.
PIN 10 IS GRD, PIN 5 IS +5V.

6.- ○ IDENTIFIED BY A LETTER ARE WIRE TIE POINTS.
7.- ⬡ ARE SUPPLY INPUTS.
8.- ○ J1 DIGITAL RECORDER.
9.- □ J6 FUNCTION PLUG-IN
10.- ⬡ J7 INPUT PLUG-IN.

C25, CR56, J7, Q6, R76, Z39, DS9

LOGIC DIAGRAM, 6970
Beckman
C22-435456
E



MM	REV	ZONE	DESCRIPTION	REQ. No.	DATE	BY	CHK'D	APP'D
	B		FINAL RELEASE	———	1/67	RL	L.W.	NNF
	C		SEE E.C.O.	12073	1/6/67	CAR	L.W.	WL

NOTE:

1- CUT 8 LENGTHS OF 22 AWG BARE WIRE (.56 LONG) USE TEFLON SLEEVING (.31 LONG) ON EACH WIRE. INSERT WIRE & SLEEVING INTO PIN HOLDING JIG, WITH .12 IN WIRE EXTENDING PLACE ON BOARD AS SHOWN. AFTER DIP SOLDERING, HAND SOLDER A1, 50 MMF DCU, IN PLACE.

● DENOTES HOLES THAT WIRES ARE TO BE INSERTED INTO

2- ALL JUMPERS 22 AWG WIRE WITH TEFLON SLEEVING

ITEM	PART NO	DESCRIPTION	QTY
2	A905-4354AB	JIG, PIN HOLDING	REF.
1	A037 435549	PARTS LIST, 6380 COUNTING UNIT	1

A855-435570	6380
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ± 100 ANGULAR ± 0° 30'
XX ± 030
XXX ± 005 MACH. SURF. ✓
THREADS: CLASS 2A OR 2B
SENSITIVE BORES & SPLINT EDGES 250 MAX
MACH. T-SLOT RADII 250 MAX
MACH. SURF. FLAT WITHIN .001 IN 1M
OTHER SURF. FLAT WITH IN .002 IN 1M
CONCENTRICITY MACH. SURF. TIR WITHIN ½ TOL. OF DIA. TOOL .001 MIN
DO NOT SCALE DRAWING

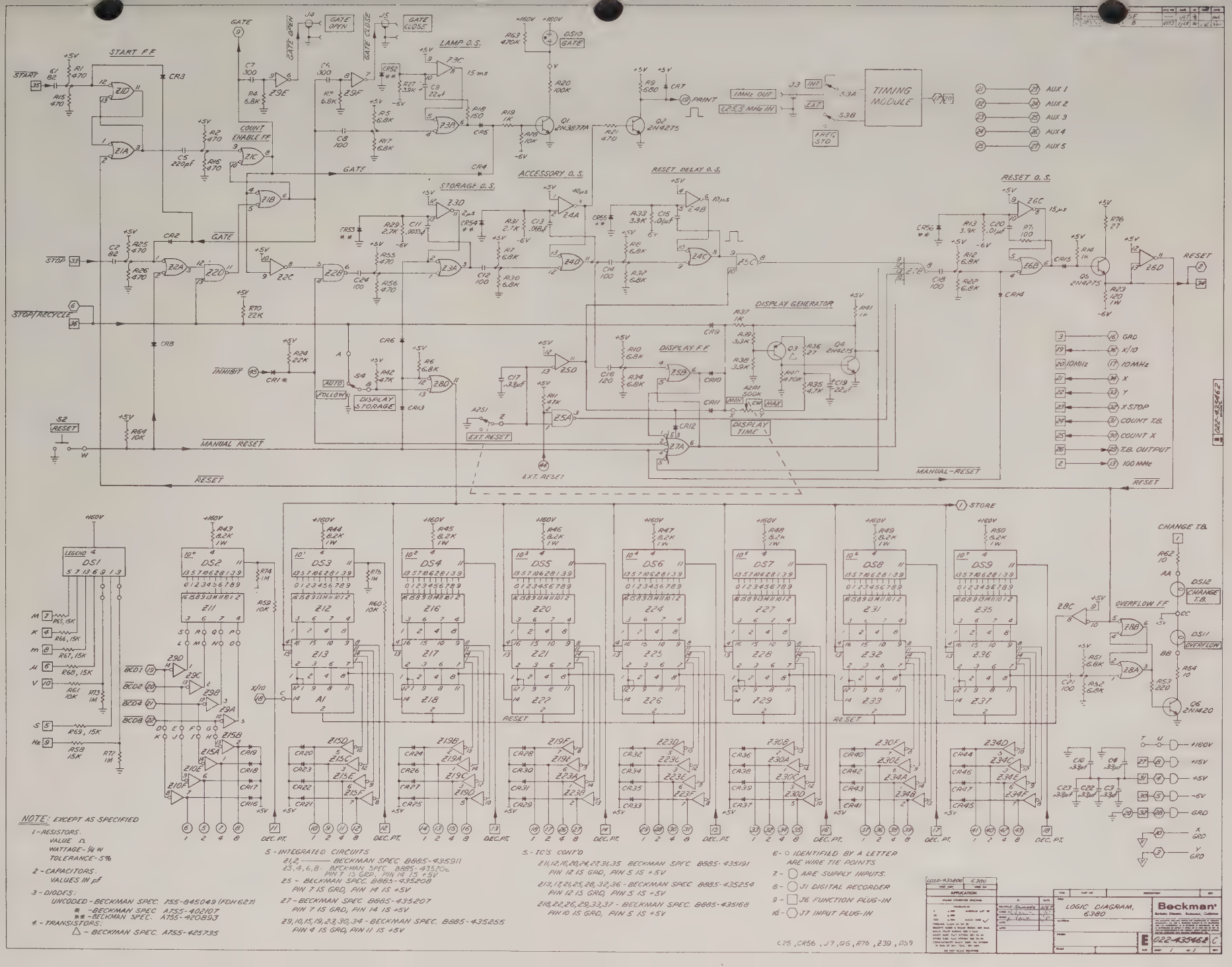
	BY	DATE
DRAWN	K Shimada	7 67
CHKD	NORTON	1/67
ENGR'G	VINSON	2/67
APP'D		
APP'D		

TITLE: BOARD ASSY, 6380 COUNTING UNIT
MATERIAL
FINISH
SCALE 2:1

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA

D 655-435550 C
SIZE SHEET 1 OF 1 REV

655-435550 C



NOTE: EXCEPT AS SPECIFIED

1 - RESISTORS:
VALUE Ω
WATTAGE - ¼ W
TOLERANCE - 5%

2 - CAPACITORS:
VALUES IN pf

3 - DIODES:
UNCODED - BECKMAN SPEC. 755-845049 (FDH627)
* - BECKMAN SPEC. A755-402107
** - BECKMAN SPEC. A755-420893

4 - TRANSISTORS:
△ - BECKMAN SPEC. A755-425735

5 - INTEGRATED CIRCUITS
Z1,2, ——— BECKMAN SPEC. B885-435911
Z3,4,6,8 ——— BECKMAN SPEC. B885-435206
PIN 7 IS GRD, PIN 14 IS +5V
Z5 - BECKMAN SPEC. B885-435208
PIN 7 IS GRD, PIN 14 IS +5V
Z7 - BECKMAN SPEC. B885-435207
PIN 7 IS GRD, PIN 14 IS +5V
Z9,10,15,19,23,30,34 - BECKMAN SPEC. B885-435255
PIN 4 IS GRD, PIN 11 IS +5V

5 - IC'S CONT'D
Z11,12,16,20,24,27,31,35 BECKMAN SPEC. B885-435191
PIN 12 IS GRD, PIN 5 IS +5V
Z13,17,21,25,28,32,36 - BECKMAN SPEC. B885-435254
PIN 12 IS GRD, PIN 5 IS +5V
Z18,22,26,29,33,37 - BECKMAN SPEC. B885-435168
PIN 10 IS GRD, PIN 5 IS +5V

6 - ○ IDENTIFIED BY A LETTER
ARE WIRE TIE POINTS

7 - ⬠ ARE SUPPLY INPUTS.

8 - ○ J1 DIGITAL RECORDER

9 - □ J6 FUNCTION PLUG-IN

10 - ⬡ J7 INPUT PLUG-IN

C25, CR56, J7, Q6, R76, Z39, DS9

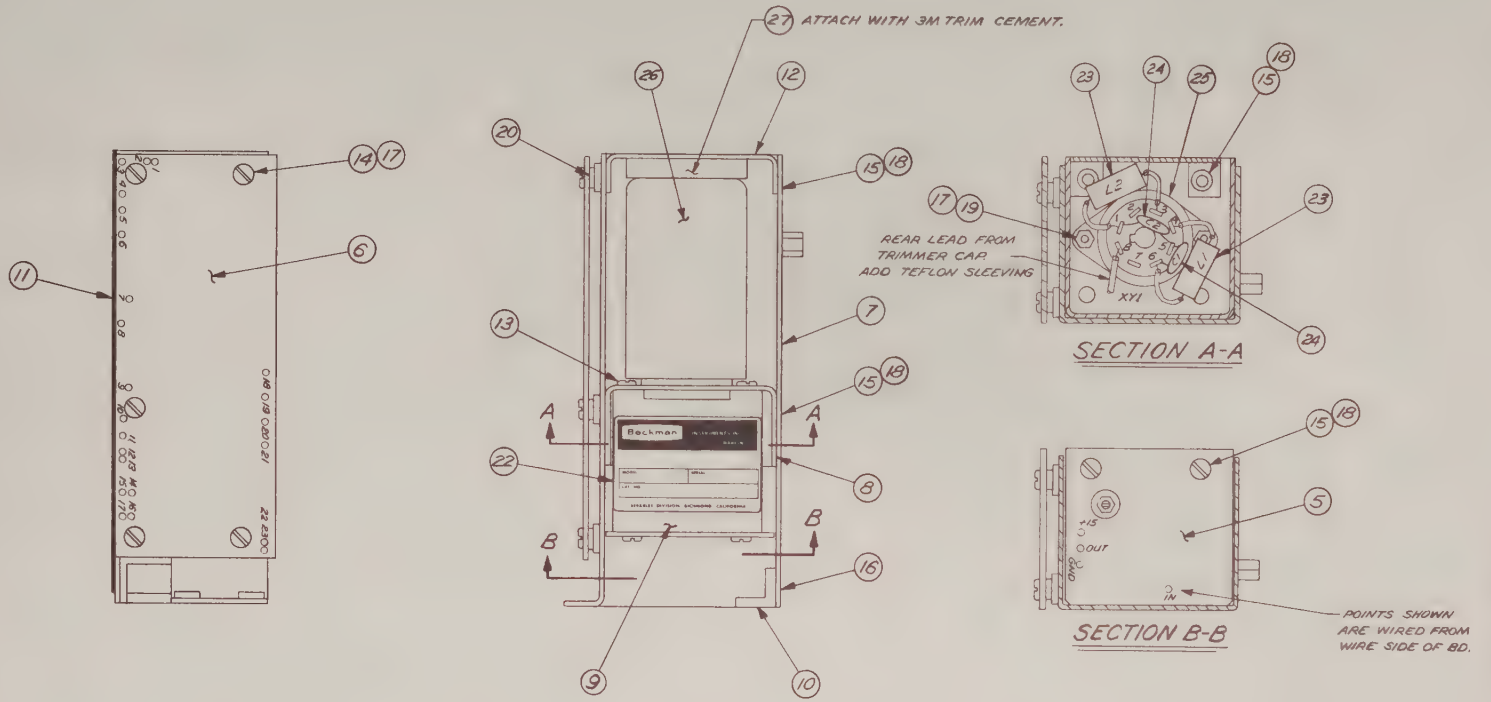
APPLICATION	6380
TITLE	LOGIC DIAGRAM, 6380
Beckman	Instruments, Inc. Fullerton, California
SIZE	E
022-435462	C

PARTS LIST

TIMING MODULE "AA"

Item No.	Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
1		C010-435639(A)	Timing Module Assembly, AA	Beckman	1
5		855-435440	Oscillator Board Assembly	Beckman	1
6		855-435660	Divider & Multiplier Board Ass'y	Beckman	1
23	L1, 2	795-807919	Inductor, 470μH	Delevan 3500-24	2
24	C1, 2	633-804706	Capacitor, F.Cerm., 0.001μf, 1000WVDC, 20%	Centralab DD-102	2
25	XY1	860-042963	Socket, Octal	Cinch 101-24-10-067	1
26	Y1	881-430340	Crystal, 1MHz	Beckman	1

(All items not listed are hardware.)



ITEM	PART NO	DESCRIPTION	QTY
		3M TRIM CEMENT	AS REQ.
1	A855-435640	PARTS LIST, TIMING MODULE	1

	BY	DATE
DRAWN	K. Shimada	6-67
CHKD	Uffang	7-67
ENGR	J. Hoey	7-67
APPD		
APPD		

UNLESS OTHERWISE SPECIFIED

TOLERANCES

X ± .030 ANGULAR ± 0° 30'
XX ± .020
XXX ± .005 MACH SURF ✓

THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES .020 MAX
MACH FILLET RADIUS .020 R MAX
MACH SURF FLAT WITHIN .001 IN/IN
OTHER SURF FLAT WITHIN .005 IN/IN
CONCENTRICITY MACH SURF T.I.R WITHIN ½ SUM OF DIA TOLS .001 MIN

DO NOT SCALE DRAWING

TITLE: TIMING MODULE ASSY, AA

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

MATERIAL

FINISH

SCALE

C SIZE

010-435639 A

SHEET 1 OF 1 REV

NEXT ASSY	USED ON
	6300

APPLICATION

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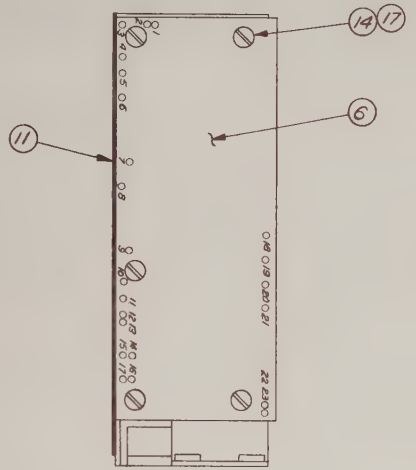
DWG NO 010-435639 REV C

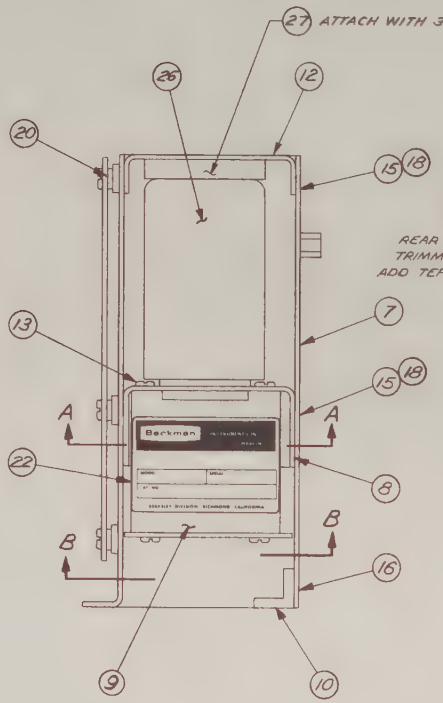
PARTS LIST

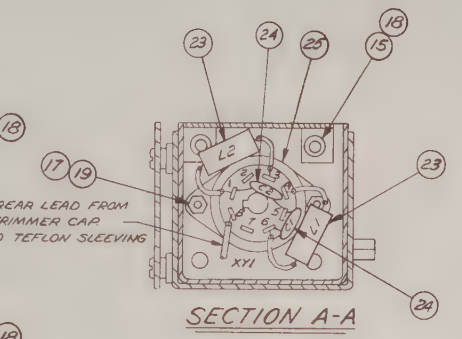
TIMING MODULE "AA"

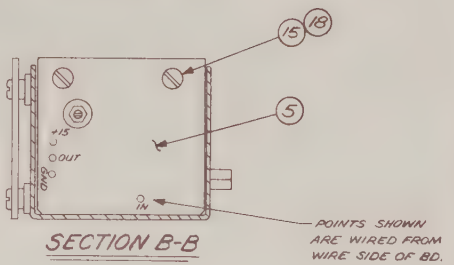
Item No.	Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
1		C010-435639(A)	Timing Module Assembly, AA	Beckman	1
5		855-435440	Oscillator Board Assembly	Beckman	1
6		855-435660	Divider & Multiplier Board Ass'y	Beckman	1
23	L1, 2	795-807919	Inductor, 470μH	Delevan 3500-24	2
24	C1, 2	633-804706	Capacitor, F.Cerm., 0.001μf, 1000WVDC, 20%	Centralab DD-102	2
25	XY1	860-042963	Socket, Octal	Cinch 101-24-10-067	1
26	Y1	881-430340	Crystal, 1MHz	Beckman	1

(All items not listed are hardware.)









ITEM	PART NO	DESCRIPTION	QTY
		3M TRIM CEMENT	AS REQ.
1	A855-435640	PARTS LIST, TIMING MODULE	1

NEXT ASSY	6300
USED ON	
APPLICATION	

UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ± 030 ANGULAR ±0° 30
XX ± 020
XXX ± 005 MACH SURF ✓
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES 020 MAX
MACH FILLET RADIUS 020 R MAX
MACH SURF FLAT WITHIN 001 IN IN
OTHER SURF FLAT WITHIN 005 IN IN
CONCENTRICITY MACH SURF TIR W THIN ½ SUM OF DIA TOLS 001 MIN
DO NOT SCALE DRAWING

	BY	DATE
DRAWN	K. Shimada	6-67
CHKD	[illegible]	7-67
ENGR	[illegible]	7-67
APPD	[illegible]	7-67
APPD		

TITLE: TIMING MODULE ASSY, AA

MATERIAL

FINISH

SCALE

SIZE: C

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

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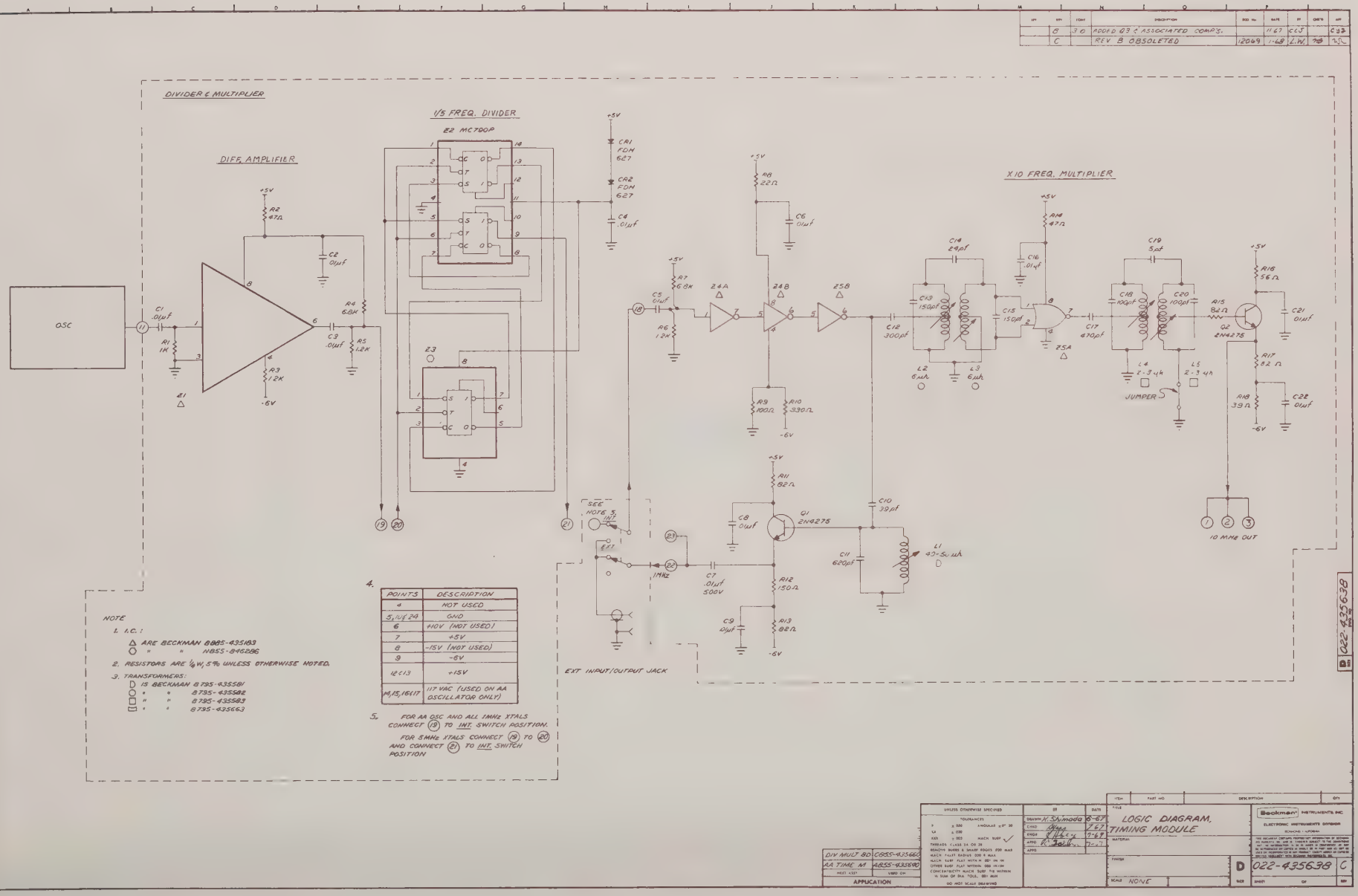
010-435639 A

SHEET 1 OF 1

DWG NO 010-435639 SIZE C

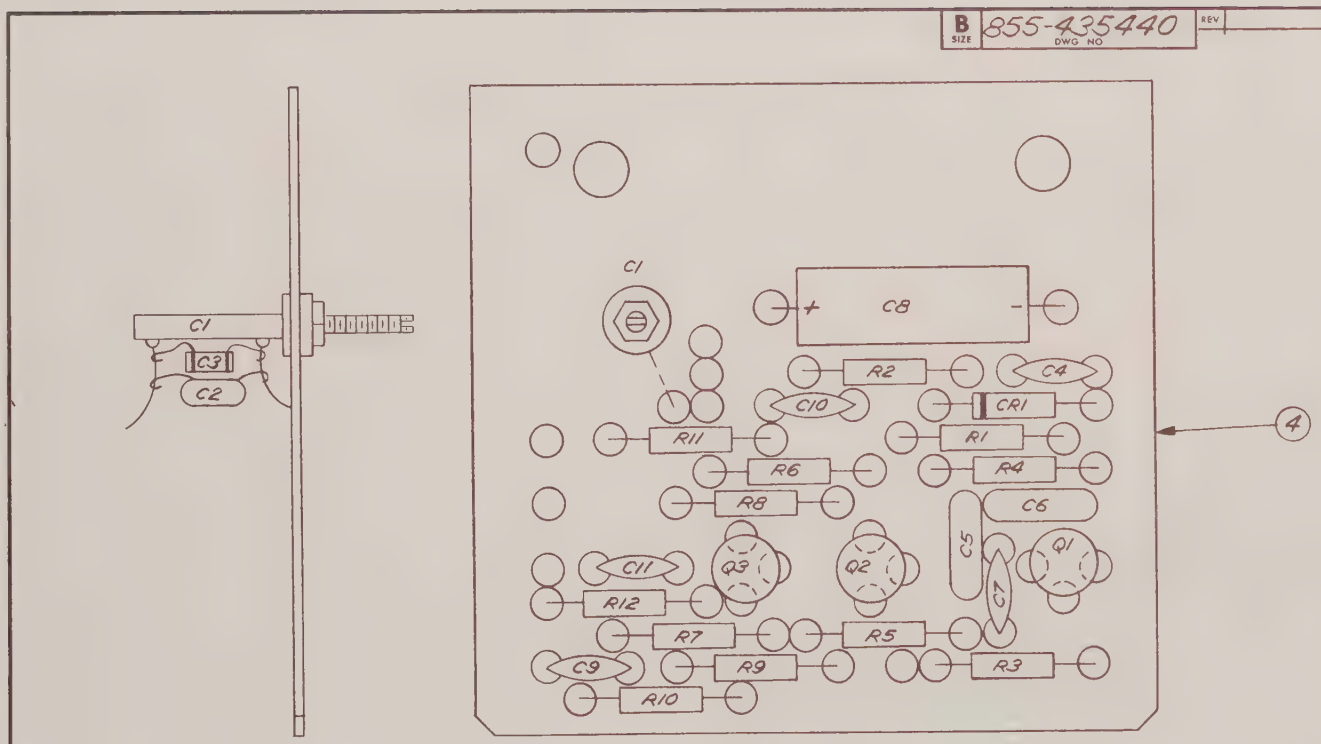

DIVIDER & MULTIPLIER
DIFF. AMPLIFIER
1/5 FREQ. DIVIDER
X10 FREQ. MULTIPLIER
OSC
E2 MC700P
CR1 FDH 627
CR2 FDH 627
Z1
Z2
Z3
Q1 2N4275
Q2 2N4275
L1 40-50 uh
L2 6 uh.
L3 6 uh.
L4 2-34
L5 2-34
JUMPER
10 MHz OUT
SEE NOTE 5
INT
EXT
1MHz
EXT INPUT/OUTPUT JACK
NOTE
1. I.C.:
△ ARE BECKMAN 8885-435183
○ " " NB55-846286
2. RESISTORS ARE 1/4 W, 5% UNLESS OTHERWISE NOTED.
3. TRANSFORMERS:
IS BECKMAN 8795-435581
8795-435582
8795-435583
8795-435563
4.
POINTS | DESCRIPTION
4 | NOT USED
5,11&24 | GND
6 | +10V (NOT USED)
7 | +5V
8 | -15V (NOT USED)
9 | -6V
12&13 | +15V
14,15,16&17 | 117 VAC (USED ON AA OSCILLATOR ONLY)
5. FOR AA OSC AND ALL 1MHz XTALS CONNECT (19) TO INT. SWITCH POSITION.
FOR 5MHz XTALS CONNECT (19) TO (20) AND CONNECT (21) TO INT. SWITCH POSITION
DIV MULT BD C8855-435660
AA TIME M A855-435890
APPLICATION
DRAWN N. Shimada 6-67
CHKD 7-67
ENGR 7-67
APPD 7-67
LOGIC DIAGRAM, TIMING MODULE
Beckman INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
D 022-435638 C
SCALE NONE
022-435638

PARTS LIST

1 MHz OSCILLATOR BOARD "AA"

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	B855-435440 (A)	Oscillator Board Assembly	Beckman	
C1	655-824658	Capacitor, V., .6-14pf	JFD-VC11-9RA-DL	1
C2	637-xxxxxx	Capacitor, Factory Selected Value	Beckman	1
C3	633-804671	Capacitor, F. Cerm., 33pf, 600V, 5%	Erie NPO-332-330J	1
C4, 7, 9, 10, 11	633-836864	Capacitor, F. Cerm., 0.01μf, 50V -20 +80%	Sprague 19C214A6	5
C5, 6	637-825349	Capacitor, F. Mica, 560pf, 300V, 5%	Electromotive DM15F561J0-300WV4CR	2
C8	631-814054	Capacitor, F. Tant., 22μf, 35V, ±20%	Sprague 150D226X-0035R2	1
CR1	755-809734	Diode, Zener, 1N758	Texas Instruments	1
Q1, 2, 3	755-419596	Transistor, Special	Beckman	3
R1, 4	601-822299	Resistor, 6.8K	*AB CB6825	2
R2, 12	601-823395	Resistor, 470Ω	AB CB4715	2
R3	601-823912	Resistor, 470K	AB CB4745	1
R5, 8	601-822328	Resistor, 2.2K	AB CB2225	2
R6	601-822324	Resistor, 10K	AB CB1035	1
R7	601-823397	Resistor, 5.6K	AB CB5625	1
R9	601-823388	Resistor, 56Ω	AB CB5605	1
R10	601-822544	Resistor, 1.8K	AB CB1825	1
R11	601-823384	Resistor, 27Ω	AB CB2705	1

*All "601" resistors are fixed composition, 1/4W, 5%; manufactured by Allen Bradley



B SIZE	855-435440 DWG NO	REV	DESCRIPTION	ECO NO	DATE	BY	CHKD	APPD

ITEM	PART NO	DESCRIPTION	QTY.
2	8020-435427	SCHEMATIC, OSCILLATOR, AA-1MHz	REF.
1	A037-435428	PARTS LIST, OSC. BD, AA-1MHz	1

UNLESS OTHERWISE SPECIFIED

TOLERANCES

.X ±.050 ANGULAR ±0° 30'

.XX ± 020

.XXX ±.005 MACH. SURF. ✓

THREADS: CLASS 2A OR 2B

REMOVE BURRS & SHARP EDGES .020 MAX

MACH. FILLET RADIUS .020 R MAX

MACH. SURF. FLAT WITHIN .001 IN/IN

OTHER SURF. FLAT WITHIN .005 IN/IN

CONCENTRICITY MACH. SURF. TIR WITHIN ½ SUM OF DIA. TOLS., .001 MIN.

DO NOT SCALE DRAWING

	BY	DATE
DRAWN	K. Shimada	6-67
CHKD	Byang	7-67
ENGR	J Hoey	7-67
APPD	[illegible]	[illegible]
APPD		

TITLE: BOARD ASSY, OSCILLATOR, AA-1MHz

MATERIAL

FINISH

SCALE 3:1

B SIZE

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

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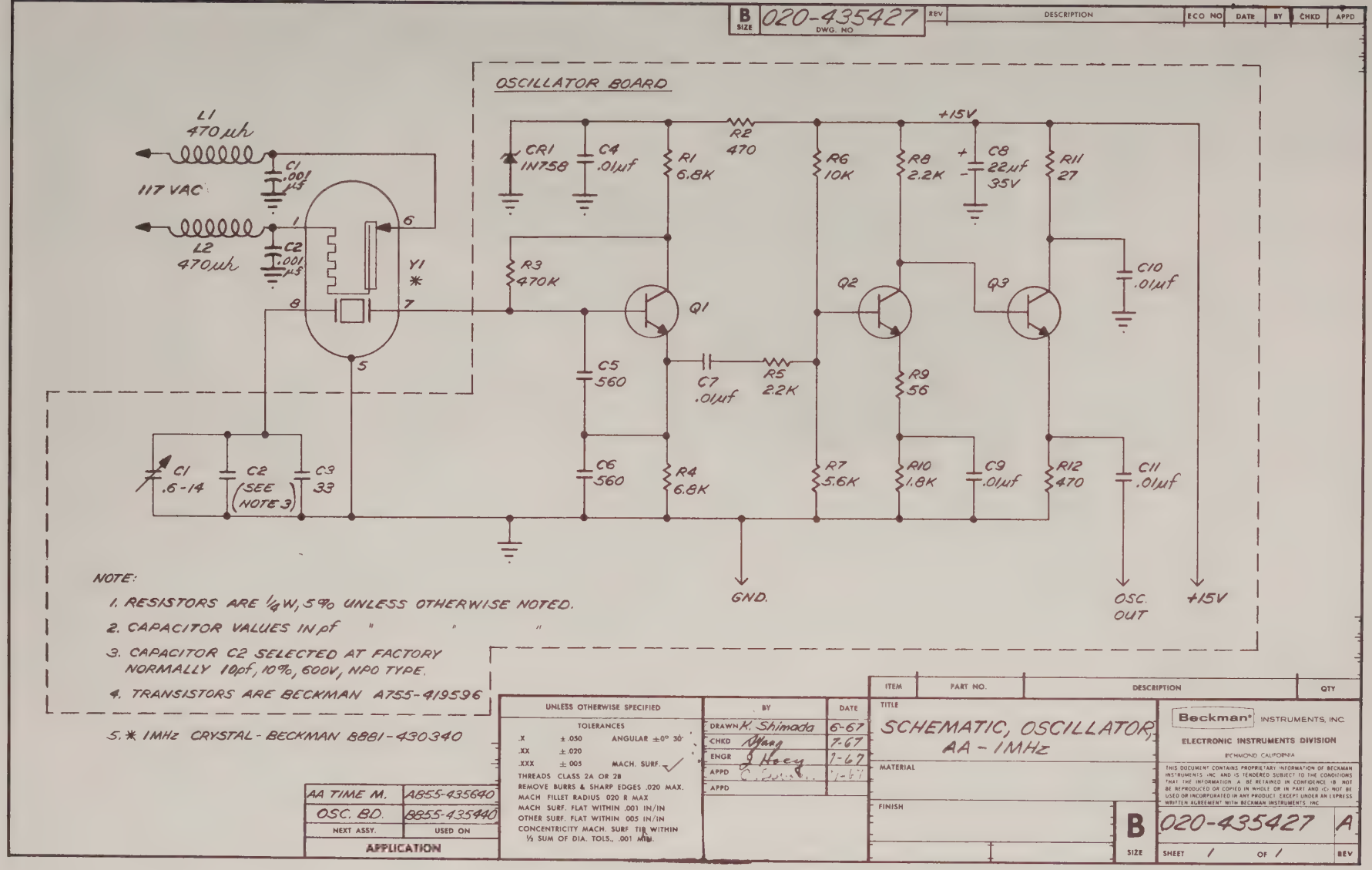
855-435440 A

SHEET 1 OF 1 REV

855-435640	AA TIME M.
NEXT ASSY	USED ON
APPLICATION	


B SIZE
020-435427
DWG. NO
REV
DESCRIPTION
ECO NO
DATE
BY
CHKD
APPD
OSCILLATOR BOARD
L1
470 μh
C1
.001 μf
117 VAC
L2
470 μh
C2
.001 μf
Y1 *
CR1
IN758
C4
.01μf
R1
6.8K
R2
470
+15V
R6
10K
R8
2.2K
C8
22μf
35V
R11
27
R3
470K
Q1
Q2
Q3
C10
.01μf
C5
560
C7
.01μf
R5
2.2K
R9
56
C1
.6-14
C2
(SEE NOTE 3)
C3
33
C6
560
R4
6.8K
R7
5.6K
R10
1.8K
C9
.01μf
R12
470
C11
.01μf
GND.
OSC. OUT
+15V
NOTE:
1. RESISTORS ARE 1/4 W, 5% UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUES IN pf " " "
3. CAPACITOR C2 SELECTED AT FACTORY NORMALLY 10pf, 10%, 600V, NPO TYPE.
4. TRANSISTORS ARE BECKMAN A755-419596
5. * 1MHz CRYSTAL - BECKMAN 8881-430340
AA TIME M. 8855-435640
OSC. BD. 8855-435440
NEXT ASSY.
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED
TOLERANCES
.X ±.050 ANGULAR ±0° 30'
.XX ±.020
.XXX ±.005 MACH. SURF.
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES .020 MAX.
MACH FILLET RADIUS .020 R MAX
MACH SURF. FLAT WITHIN .001 IN/IN
OTHER SURF. FLAT WITHIN .005 IN/IN
CONCENTRICITY MACH. SURF TIR WITHIN ½ SUM OF DIA. TOLS., .001 MAX.
BY
DATE
DRAWN K. Shimada 6-67
CHKD 7-67
ENGR 7-67
APPD
APPD
ITEM
PART NO.
DESCRIPTION
QTY
TITLE
SCHEMATIC, OSCILLATOR, AA - 1MHz
MATERIAL
FINISH
B SIZE
020-435427
A
SHEET 1 OF 1
REV
Beckman INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND CALIFORNIA
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PARTS LIST

AA TIMING MODULE

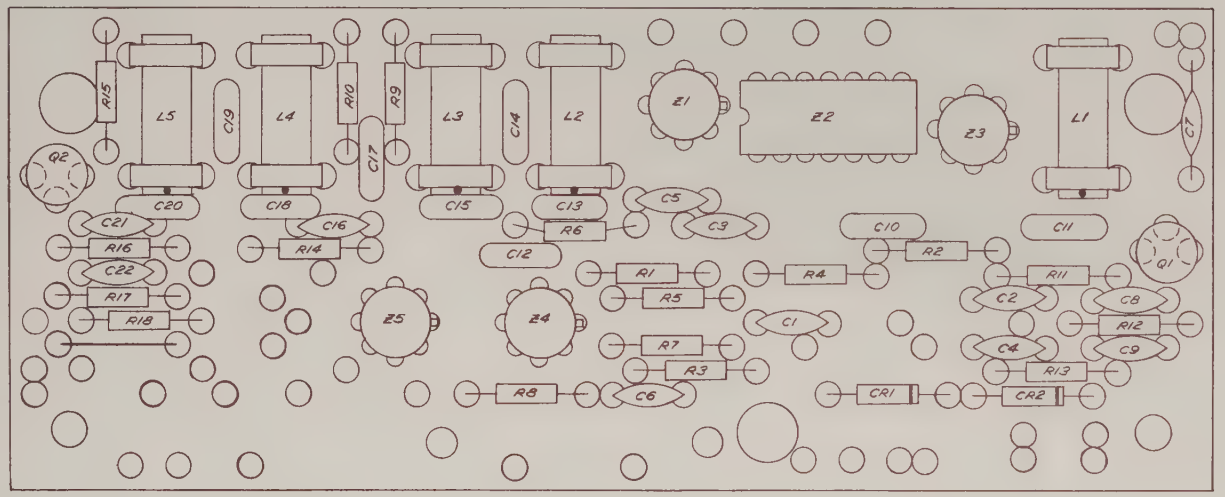
DIVIDER & MULTIPLIER BOARD ASSEMBLY

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	855-435660 (C)	Divider & Multiplier Board Assembly	Beckman	1
C1 thru 6, 8, 9, 16, 21, 22	633-836864	Capacitor, F. Cerm., 0.01μf, 50V, -20 +80%	Sprague 19C214A6/ TG-S10	11
C7	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	Sprague 29C9B5	1
C10	637-825335	Capacitor, F. Mica, 39pf, 500V, 5%	* DM15-E390J0-500WV4CR	1
C11	637-822250	Capacitor, F. Mica, 620pf, 300V, 5%	DM15-F621J0-300WV4CR	1
C12	637-825348	Capacitor, F. Mica, 300pf, 500V, 5%	DM15-F301J0-500WV4CR	1
C13, 15	637-825104	Capacitor, F. Mica, 150pf, 500V, 5%	DM15-F151J0-500WV4CR	2
C14	637-822769	Capacitor, F. Mica, 24pf, 500V, 5%	DM15-C240J0-500WV4CR	1
C17	637-822909	Capacitor, F. Mica, 470pf, 500V, 5%	DM15-F1471J0-500WV4CR	1
C18, 20	637-822251	Capacitor, F. Mica, 100pf, 500V, 5%	DM15-F101J0-500WV4CR	2
C19	637-825227	Capacitor, F. Mica, 5pf, 500V, 10%	DM15-C050K0-500WV4CR	1
CR1, 2	755-845049	Diode, FDH 627	Fairchild	2
L1	795-435581	Inductor, V., RF, Nom. 40-50μH	Beckman	1
L2, 3	795-435582	Inductor, V., RF, Nom. 6μH	Beckman	2
L4, 5	795-435583	Inductor, V., RF, Nom. 2-3μH	Beckman	2
Q1, 2	755-857274	Transistor, 2N4275	Fairchild	2
R1	601-822308	Resistor, 1K	** CB1025	1
R2, 14	601-823387	Resistor, 47Ω	CB4705	2
R3, 5, 6	601-822326	Resistor, 1.2K	CB1225	3
R4, 7	601-822299	Resistor, 6.8K	CB6825	2
R8	601-823383	Resistor, 22Ω	CB2205	1
R9	601-817735	Resistor, 100Ω	CB1015	1
R10	601-823394	Resistor, 330Ω	CB3315	1
R11, 13, 15, 17	601-822375	Resistor, 82Ω	CB8205	4
R12	601-823391	Resistor, 150Ω	CB1515	1
R16	601-823388	Resistor, 56Ω	CB5605	1
R18	601-823386	Resistor, 39Ω	CB3905	1
Z1, 4, 5	885-435183	I.C., Dual 2 Input Gate	Beckman	3
Z2	885-846399	I.C., Dual J-K Flip-Flop	Motorola MC790P	1
Z3	885-846286	I.C., J-K Flip-Flop	Fairchild UX8992328X	1

* All "DM15" numbers are manufactured by Electromotive

** All "601" resistors are fixed composition, 1/4W, 5%; manufactured by Allen Bradley

ZONE	REV	EFF.	DESCRIPTION	ECO No.	DATE	BY	CHK'D	APP'D
3-C	B		ADDED Q3 & ASSOCIATED COMP'S.	-	11-67	CCS		CSZ
	C		DELETED R19,20,21,22, C23 & Q3, ADDED JUMPER	12069	1-68	L.W	MB	WM



• DENOTES RED DOT ON INDUCTORS

C 855-435660 DWG NO

ITEM	PART NO	DESCRIPTION	QTY
2	0002-435638	LOGIC DIAGRAM	REF
1	A037-435605	PARTS LIST, DIVIDER & MULT. ASSY.	1

UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ± .050 ANGULAR ± 0° 30'
XX ± .020
XXX ± .005 MACH SURF ✓
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES .020 MAX
MACH FILLET RADIUS .020 R MAX
MACH SURF FLAT W THIN .001 IN IN
OTHER SURF FLAT W THIN .005 IN IN
CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF D.A. TOLS .001 MIN
DO NOT SCALE DRAWING

	BY	DATE
DRAWN	K. Shimada	6-67
CHKD	[illegible]	7-67
ENGR	[illegible]	7-67
APPD	[illegible]	1-68
APPD		

TITLE: BOARD ASSEMBLY, DIVIDER & MULTIPLIER
MATERIAL
FINISH
SCALE
C SIZE
SHEET 1 OF 1
REV

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

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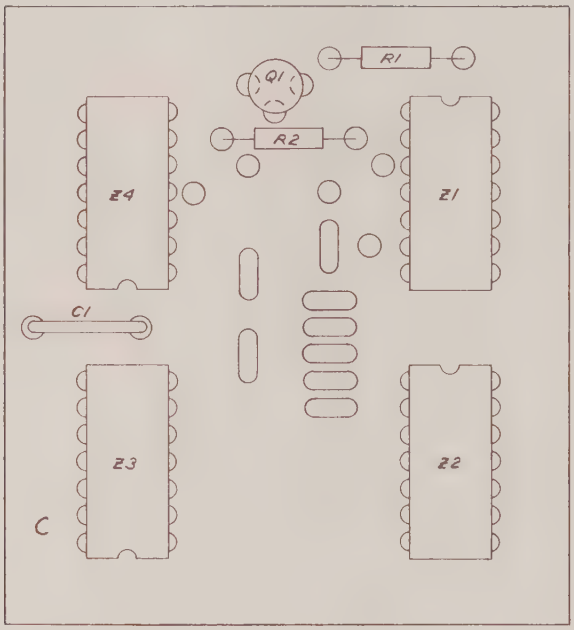
855-435660 C

855-435640	AA 05C
NEXT ASSY.	USED ON
APPLICATION	

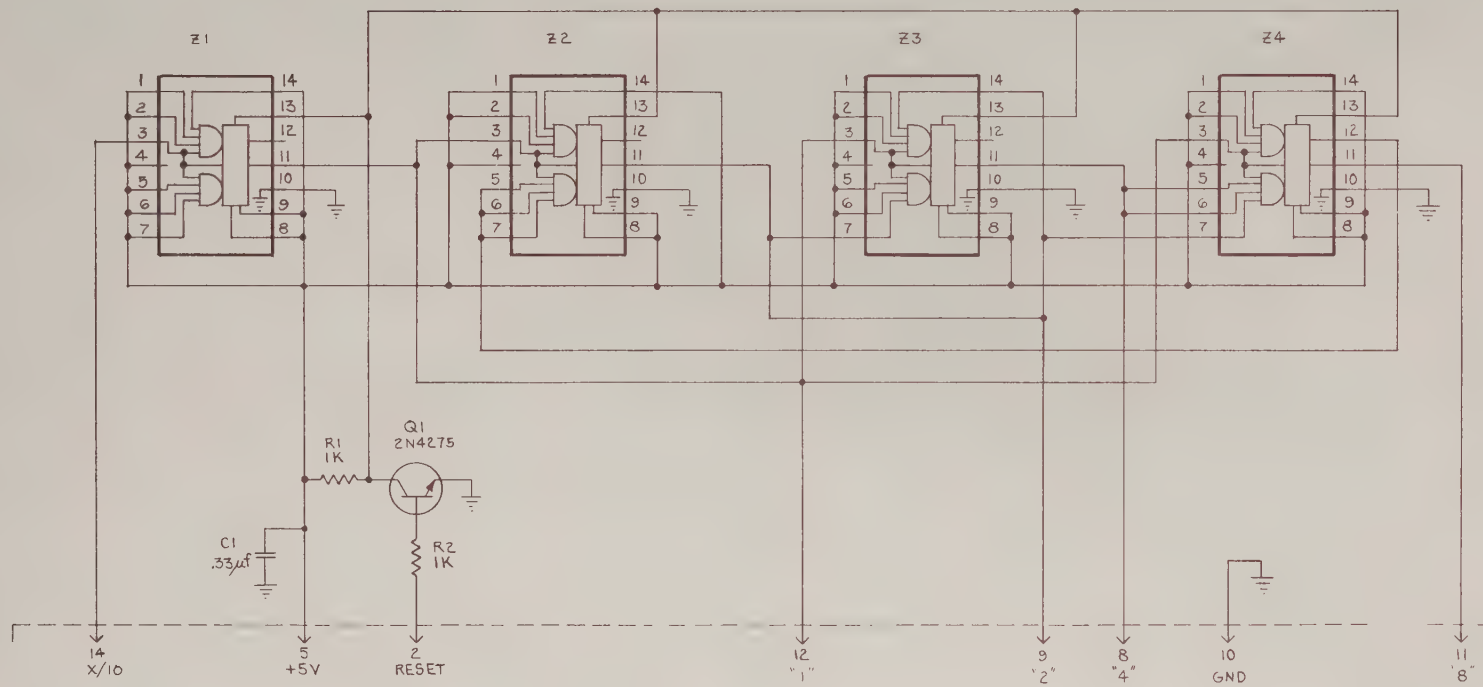


50 MHz DCU BOARD ASSEMBLY
(Dwg. No. B435430 - Rev. A)

PARTS LIST

50 MHz DCU BOARD

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	855-435430 (A)	50 MHz DCU Board Assembly	Beckman	
C1	633-815873	Capacitor, F. Cerm., 0.33μf, 25V	Sprague 5C10A	1
Q1	755-857274	Transistor, 2N4275	Fairchild	1
R1, 2	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	Allen Bradley CB1025	2
Z1, 2, 3, 4	885-435256	I. C., SF203	Beckman	4



NOTES:

1. RESISTORS 1/4W 5%, UNLESS OTHERWISE NOTED.
2. Z1,2,3,4 PER BECKMAN SPEC B885-435256

ITEM	PART NO	DESCRIPTION	QTY

ZONE	REV	EFF	DESCRIPTION	ECO No	DATE	BY	CHK'D	APP'D

UNLESS OTHERWISE SPECIFIED	BY	DATE
TOLERANCES	DRAWN G. WILSON	5/67
X ±.050 ANGULAR ±0° 30'	CHK'D J.A. Stockwell	11/67
XX ±.020	ENGR N. VINSON	11/67
XXX ±.005 MACH SURF ✓	APP'D	
THREADS CLASS 2A OR 2B	APP'D	
REMOVE BURRS & SHARP EDGES .020 MAX		
MACH FILLET RADIUS .020 R MAX		
MACH SURF FLAT WITHIN .001 IN/IN		
OTHER SURF FLAT WITHIN .005 IN IN		
CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF DIA TOLS. .001 MIN		
DO NOT SCALE DRAWING		

NEXT ASSY	USED ON
8855 435430	6300
APPLICATION	

TITLE: LOGIC DIAGRAM, 50MHz DCU

MATERIAL:

FINISH:

SCALE:

SIZE: C

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

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022-435419 A

SHEET 1 OF 1

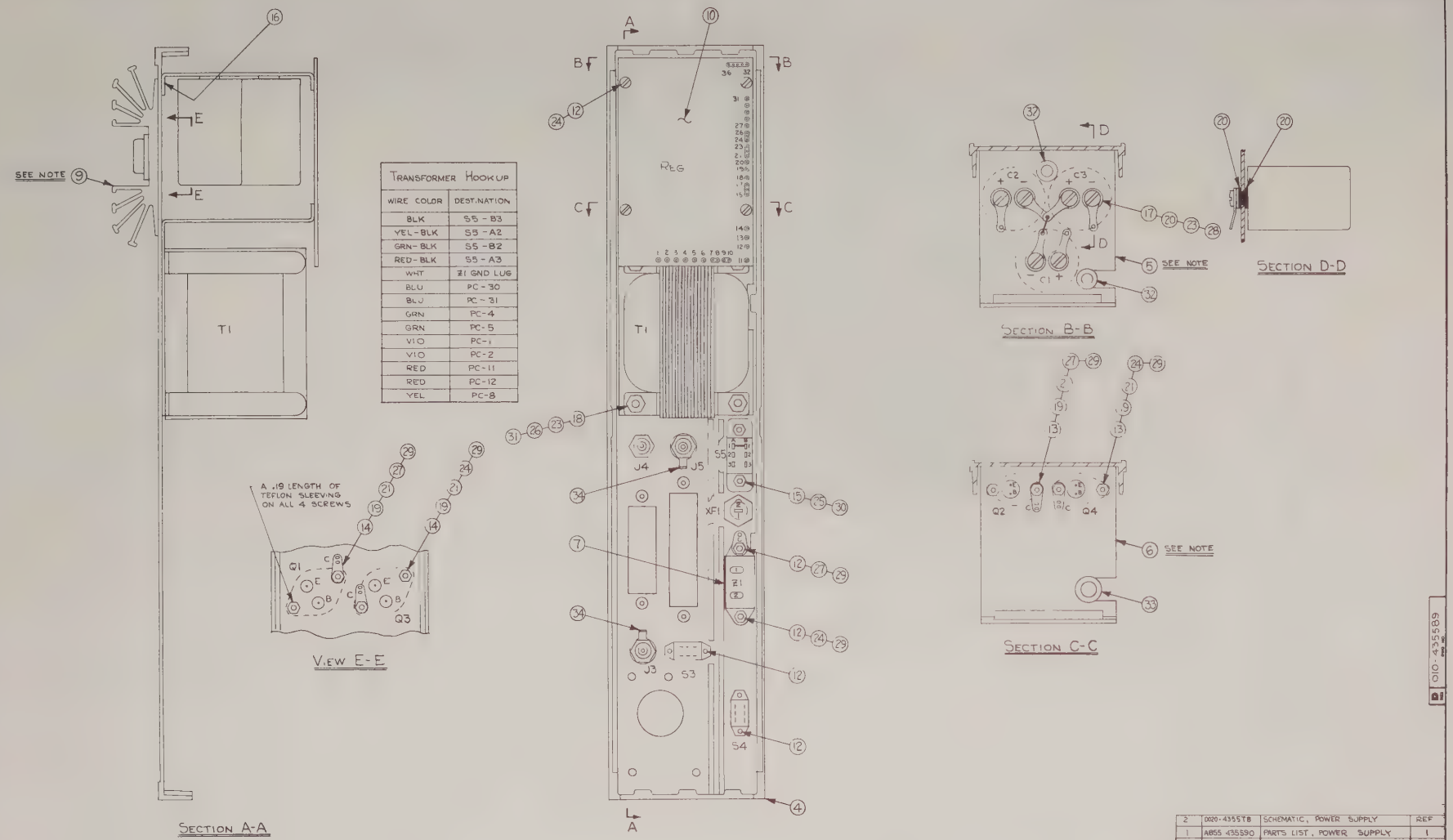
DWG NO 022-435419 SIZE C

PARTS LIST

POWER SUPPLY

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	855-435589 (B)*	Power Supply Assembly	Beckman	
	855-435580 (B)	Regulator P.C. Assembly	Beckman	1
C1, 3	631-857305	Capacitor, F. Elect., 4600μf, 15V -10 +75%	Sprague 36D462G015AA6A	2
C2	631-857304	Capacitor, F. Elect., 2700μf, 25V -10 +75%	Sprague 36D272G025AA6A	1
J3, 4, 5	670-854373	Connector, BNC	Kings KC-79-35	3
Q1, 3	755-833017	Transistor, 2N3055	RCA	2
Q2	755-839146	Transistor, 40250	RCA	1
Q4	755-857374	Transistor, 2N4240	RCA	1
S3, 4	716-827410	Switch, Slide, DPDT	Continental Wirt Electronics 126	2
S5	716-857276	Switch, Slide, 115/230, 3A/125VAC	Switchcraft 46256LF	1
T1	792-435429	Transformer, Power	Beckman	1
XF1	735-007268	Fuse Holder	Bussman HKP	1
Z1	771-857281	Line Filter/Socket	Sprague JN1D-1569A	1
	864-435535	Insulator, Filter	Beckman	1
	776-857300	Heat Sink (P/O B435552)	Wakefield NC-641K	1
	776-435552	Heat Sink Modification	Beckman	1

*Dwg.: Rev. A



TRANSFORMER HOOKUP	
WIRE COLOR	DEST.NATION
BLK	S5 - B3
YEL-BLK	S5 - A2
GRN-BLK	S5 - B2
RED-BLK	S5 - A3
WHT	Z1 GND LUG
BLU	PC - 30
BLU	PC - 31
GRN	PC-4
GRN	PC-5
VIO	PC-1
VIO	PC-2
RED	PC-11
RED	PC-12
YEL	PC-8

NOTE:
USE SILICON GREASE BETWEEN THESE PARTS & REAR PANEL

A855-435570	6380
A855-435560	6370
A855 435470	6360

ITEM	PART NO	DESCRIPTION	QTY
2	0020-435578	SCHEMATIC, POWER SUPPLY	REF
1	A855 435590	PARTS LIST, POWER SUPPLY	1

DRAWN J. WAGAR 5/67
LEAD J. WARREN 11-67
ENGR N. VINSON 11/67
APPD
APPD

TITLE: Power Supply Assembly
MATERIAL
FIN SH
SCALE

Beckman INSTRUMENTS, INC. ELECTRONIC INSTRUMENTS DIVISION RICHMOND, CALIFORNIA

D 010-435589 A

SIZE D | SHEET 1 OF 1 | REV

010-435589

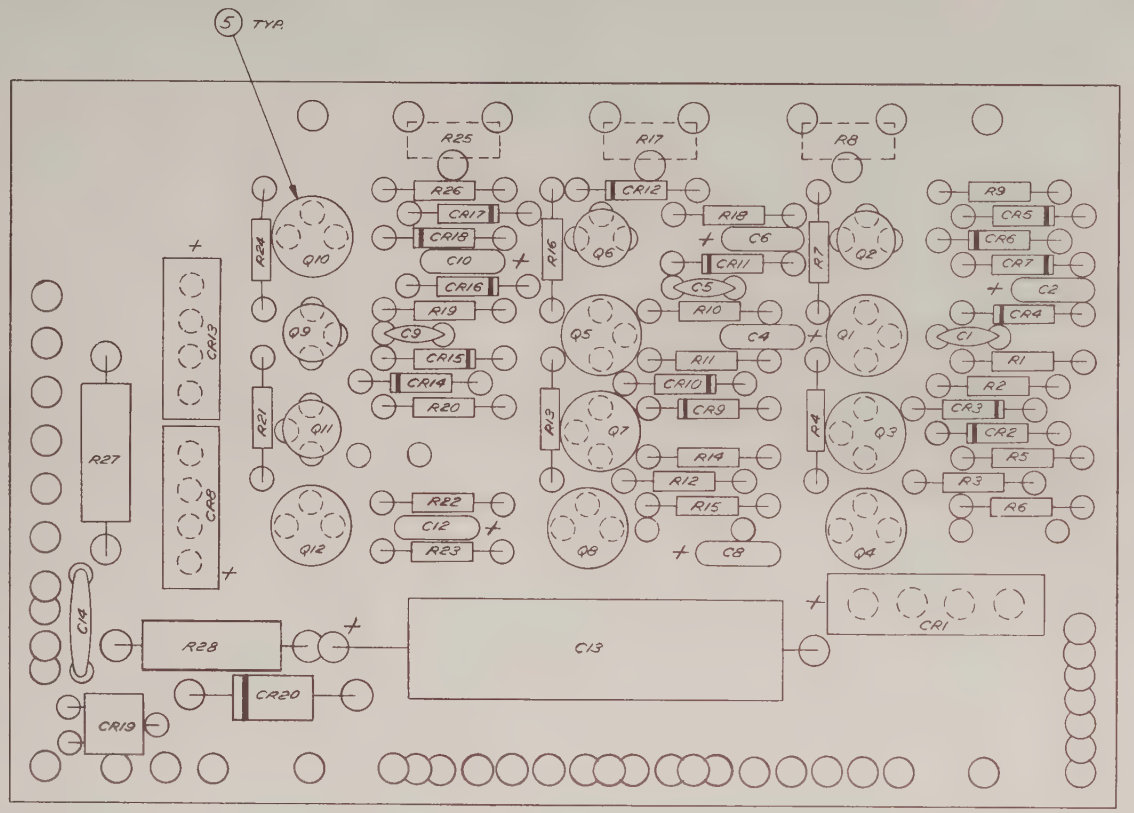
PARTS LIST

REGULATOR BOARD ASSEMBLY

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
	C855-435580(B)	Regulator P.C. Assembly	Beckman	
C1, 5, 9	633-836864	Capacitor, F.Cerm., 0.01μf, 50V, -20 +80%	Sprague 19C214A6	3
C2, 4, 10	631-857307	Capacitor, F.Tant., 250μf, 6V, ±20%	Components Inc. TSD 5-6-257	3
C6	631-857344	Capacitor, F.Tant., 100μf, 15V, ±20%	Components Inc. TSD 5-15-107	1
C8	631-857298	Capacitor, F.Tant., 22μf, 25V, ±20%	Components Inc. TSD 5-25-226	1
C12	631-857297	Capacitor, F.Tant., 68μf, 10V, ±20%	Components Inc. TSD 4-10-686	1
C13	631-857070	Capacitor, F.Elect., 8μf, 250V	Sprague TVA-1503	1
C14	633-804718	Capacitor, F.Cerm., 0.01μf, 500V	Erie Electronics 811	1
CR1	774-857301	Rectifier Bridge, 4A, 50V	Motorola MDA 970-1	1
CR2, 3, 5, 6, 7, 9, 10, 14, 15, 17, 18	755-845049	Diode, FDH 627	Fairchild	11
CR4	755-822707	Diode, Zener, 1N748A, 3.9V, 5%	Texas Instruments	1
CR8, 13	774-857303	Rectifier Bridge, 1.5A, 50V	Motorola MDA 942A-1	2
CR11	755-814019	Diode, Zener, 1N754A, 6.8V, 5%	Motorola	1
CR12	755-818496	Diode, Zener, 1N751A, 5.1V, 5%	Texas Instruments	1
CR16	755-821972	Diode, Zener, 1N750A, 4.7V, 5%	Texas Instruments	1
CR19	774-857279	Rectifier, Full Wave, 1A, 400V	Motorola	1
CR20	755-857371	Diode, Zener, 160V, 2W	Components Inc. LMZ-160A	1
Q1, 3, 4, 5, 7, 8, 10	755-838105	Transistor, 2N3638	Fairchild	7
Q2, 6, 9, 11	755-857274	Transistor, 2N4275	Fairchild	4
Q12	755-817964	Transistor, 2N1420	Texas Instruments	1
R1, 18	601-823105	Resistor, F.Comp., 470Ω, 1/4W, 10%	*AB CB4711	2
R2, 11, 20	601-823386	Resistor, F.Comp., 39Ω, 1/4W, 10%	AB CB3901	3
R3, 4, 9, 12, 13, 21, 23, 26	601-823111	Resistor, F.Comp., 1K, 1/4W, 10%	AB CB1021	8
R5, 6, 14, 15, 22	601-815239	Resistor, F.Comp., 4.7K, 1/4W, 10%	AB CB4721	5
R7, 24	601-823925	Resistor, F.Comp., 47Ω, 1/4W, 10%	AB CB4701	2
R8, 17, 25	614-857262	Resistor, V., 500Ω, 1/8W, 30%	CTS X-201	3
R10	601-823112	Resistor, F.Comp., 1.5K, 1/4W, 10%	AB CB1521	1
R16	601-823929	Resistor, F.Comp., 100Ω, 1/4W, 5%	AB CB1015	1
R19	601-823937	Resistor, F.Comp., 680Ω, 1/4W, 10%	AB CB6811	1
R27	601-800105	Resistor, F.Comp., 150K, 1W, 10%	AB GB1541	1
R28	601-012462	Resistor, F.Comp., 68K, 1W, 10%	AB GB6831	1
	864-811098	Transistor Pad	Milton Ross 10099	8

*Allen Bradley

ZONE	REV	ECP	DESCRIPTION	ECO No	DATE	BY	CHK'D	APP'D
	B		FINAL RELEASE	——	11/67	[illegible]	L.W.	N+V



B55-435580 DWG NO. C SIZE

ITEM	PART NO	DESCRIPTION	QTY
2	0020-435578	POWER SUPPLY SCHEMATIC	REF
1	A037-435579	PARTS LIST, REGULATOR	1

UNLESS OTHERWISE SPECIFIED

TOLERANCES
X ± 030 ANGULAR ± 0° 30
XX ± 020
XXX ± 005 MACH SURF ✓
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES 020 MAX
MACH FILLET RADIUS 020 R MAX
MACH SURF FLAT W TH N 001 IN IN
OTHER SURF FLAT WITH N 005 IN IN
CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF DIA TOLS 001 MIN
DO NOT SCALE DRAWING

	BY	DATE
DRAWN	K. Shimada	6-67
CHKD	L. WARREN	11-67
ENGR	N. VINSON	11/67
APPD		
APPD		

TITLE: BOARD ASSEMBLY, REGULATOR

MATERIAL

FINISH

SCALE

C SIZE

Beckman® INSTRUMENTS, INC
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA

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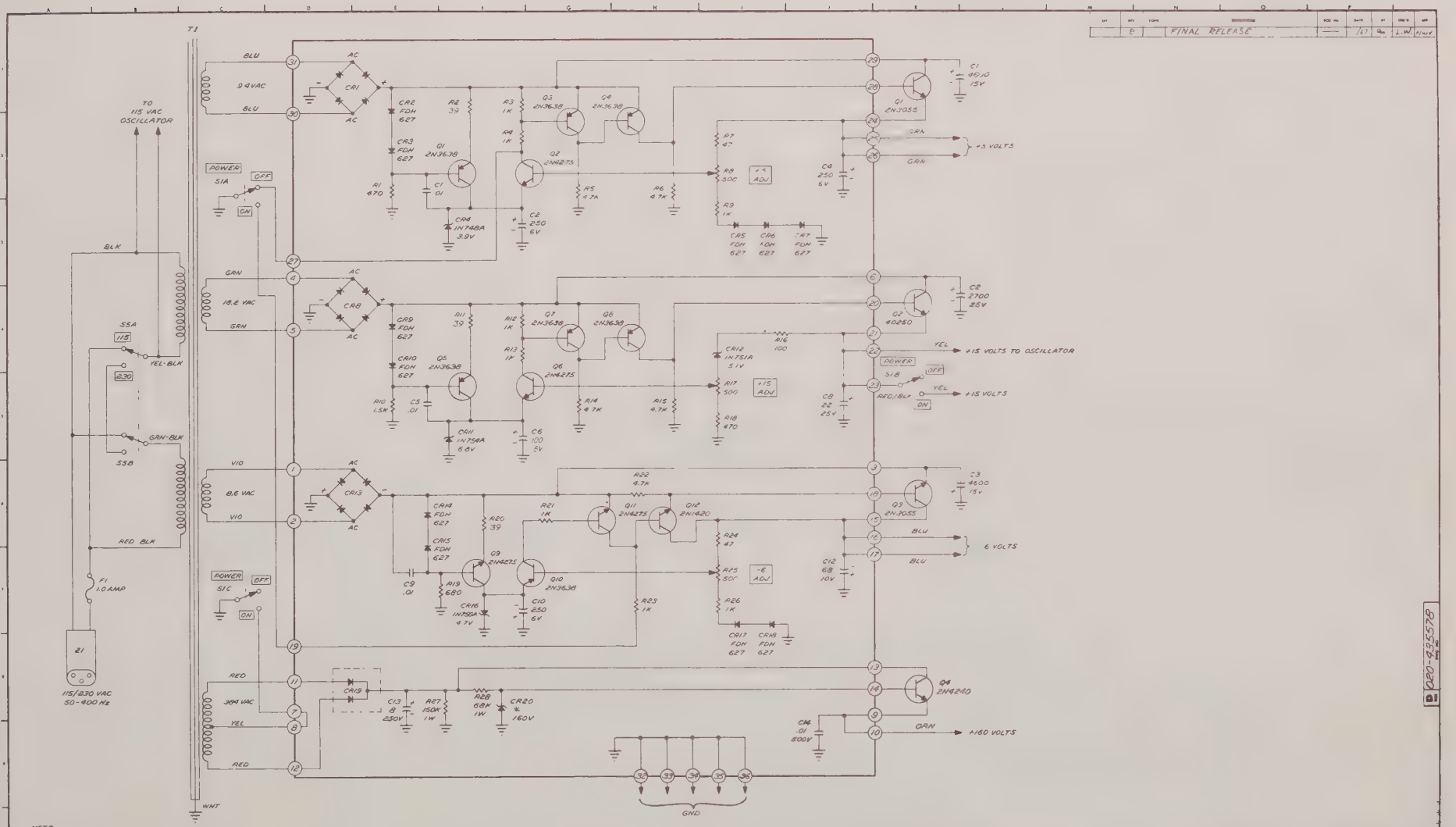
B55-435580 B

SHEET 1 OF 1 REV

A855-435590	6300
NEXT ASSY	USED ON
APPLICATION	



NOTE
1. RESISTORS ARE ½W, 10%, UNLESS OTHERWISE NOTED.
2. CAPACITORS ARE IN µF " " "
3. DIODE:
BECKMAN PART Nº 755-857371

BY	REV.	ITEM	PCO No.	DATE	BY	CHK'D	APP'D
	E	FINAL RELEASE	—	1/67	L.W.	NWF	

ITEM	PART NO	DESCRIPTION	QTY

UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ± .010 ANGULAR ± 0° 30'
XX ± .005
XXX ± .001 MACH SURF ✓
THREADS CLASS 3A OR 3B
REMOVE BURRS & SHARP EDGES 005 MAX
MACH FILLET RADIUS .010 R MAX
MACH SURF FLAT WITHIN .001 IN IN
OTHER SURF FLAT WITHIN .003 IN IN
CONCENTRICITY MACH. SURF. TIR WITHIN .5 SUM OF D+ TOLS .001 M/M
DO NOT SCALE DRAWING

	BY	DATE
DRAWN	A. Shimooda	6-67
CHK'D	J. WARREN	11-67
ENGR	N. VINSON	11-67
APP'D		
MFG		

TITLE: SCHEMATIC, POWER SUPPLY
MATERIAL
FINISH
SCALE NONE
SIZE D
DRAWING NO. 020-435578
REV. B
SHEET OF

Beckman® INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA

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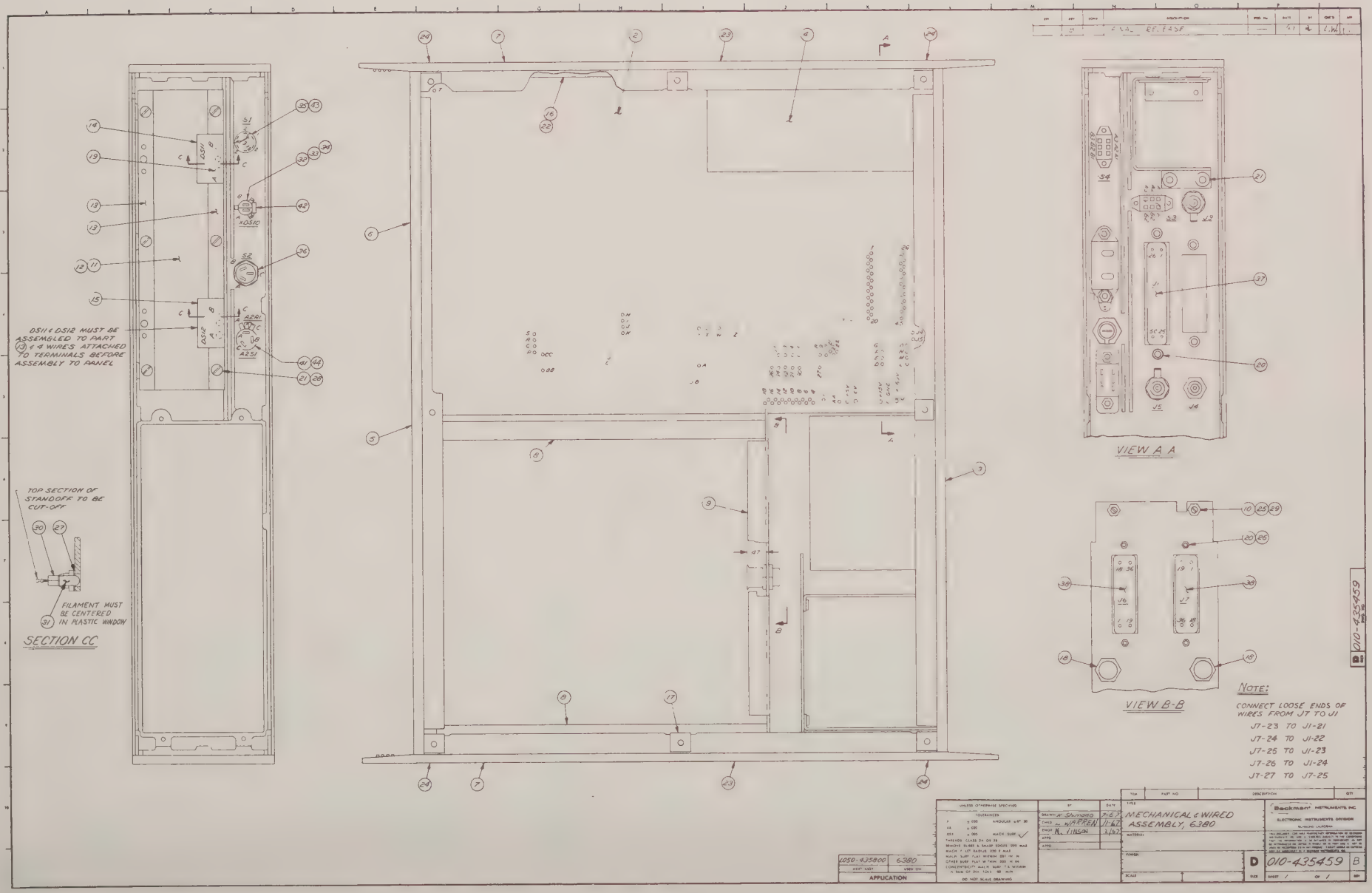
ABM 435590 | 6300 SERIES
NEXT ASSY | USED ON
APPLICATION

020-435578 B

MISCELLANEOUS PARTS

Detail No.	Beckman Stock No.	Description	Typical Manufacturer & No.	Qty./ Ass'y
A2	614-857291	Resistor, V., 500K (Switch Assembly)	Mallory MLC 500K/ MOAC-3	
DS1	751-857284	Readout Tube (Legend)	Nat'l Elec. NL867	1
*DS2 thru DS7	751-857285	Readout Tube (Numerical)	Nat'l Elec. NL842	6
DS10	825-824973	Lamp, Plug-In Cartridge	Eldema CG3-CC-A1B	1
DS11, 12	825-435536	Lamp, Incandescent, 5V	Beckman	2
F1	731-008395	Fuse, 1A, 3AG	Littelfuse 312	1
J1	697-435609	Connector and Wire Part	Beckman	
J6, 7	697-435608	Connector Ass'y and Wire Part (1 part)	Beckman	1
R63	601-823912	Resistor, F.Comp., 470K, 1/4W, 5%	Allen Bradley CB4745	1
S1	711-436308	Modification, Power Switch	Beckman	1
S2	704-813496	Switch, Pushbutton, SPDT, Reset	Switchcraft 913	1
XDS10	824-824974	Socket, Lamp	Eldema 2K	1
	132-824977	Clip, Lamp Retainer	Eldema 081-10905	1
	695-857290	Terminal, Standoff	USECO 1491A-9	4
	330-435312	Bail, Handle	Beckman	1
	327-435336	Bracket, Handle Bail	Beckman	1
	313-435301	Foot, Rubber	Beckman	2
	325-857269	Knob, Round	Buckeye B1000023	2
	664-853435	Line Cord	Belden 1725B	1

*Model 6370: DS2 thru 8 (Qty. 7)
Model 6380: DS2 thru 9 (Qty. 8)


DS11 & DS12 MUST BE ASSEMBLED TO PART 13 & 4 WIRES ATTACHED TO TERMINALS BEFORE ASSEMBLY TO PANEL
TOP SECTION OF STANDOFF TO BE CUT-OFF
FILAMENT MUST BE CENTERED IN PLASTIC WINDOW
SECTION CC
VIEW A A
VIEW B-B
NOTE:
CONNECT LOOSE ENDS OF WIRES FROM J7 TO J1
J7-23 TO J1-21
J7-24 TO J1-22
J7-25 TO J1-23
J7-26 TO J1-24
J7-27 TO J7-25
MECHANICAL & WIRED ASSEMBLY, 6380
Beckman INSTRUMENTS, INC
ELECTRONIC INSTRUMENTS DIVISION
D 010-435459 B
1050-435800 6380
APPLICATION
DO NOT SCALE DRAWING

SECTION 6
OPTIONS

6.1 GENERAL

Paragraph 1-5 lists the options which are available with the Model 6300 Series Counting Units. Options included in your instrument are described on sheets inserted loosely after this page.

Notes

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continued . . .

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